Federation of Rhodesia and Nyasaland

REPORT

of the

SECRETARY

to the

FEDERAL MINISTRY OF AGRICULTURE

For the Year Ended 30th September, 1958

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REPORT OF THE SECRETARY TO THE FEDERAL MINISTRY OF AGRICULTURE WHICH INCLUDES THE DEPARTMENTS OF RESEARCH AND SPECIALIST SERVICES, CONSERVATION AND EXTENSION SERVICES, VETERINARY SERVICES, AND TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION, FOR THE YEAR ENDED 30TH SEPTEMBER, 1958.

J. R. CORRY, SECRETARY FOR AGRICULTURE.

Since the end of 1955, and leaving aside the superficial effects of the Suez crisis, the slowing down in economic activity in North America and Western Europe has given rise to a decline in the prices of primary products. By early 1958, the average world price of primary products had fallen by five per cent. The impact of this upon the position of the non-industrial countries as a whole has been aggravated by the continued rise, by about six per cent. in the same period, of the price of manufactured goods.

A situation of this kind entails a deterioration in the terms of trade between primary producing and manufacturing countries. The effects of this upon the Federation, however, have been uneven. The chief export, copper, fell in price by 55 per cent., whereas the price of tobacco fell only fractionally.

The reduced value of exports was to some extent offset by an increase in volume, but the total value of consumer expenditure continued to rise causing a more than proportionate increase in imports, with the result that a balance of trade deficit had appeared by the end of 1957.

In an effort to correct the trend, credit restrictions were imposed in February, 1958.

Generally speaking the balance of payments position has had little effect on agriculture other than through the credit restrictions. These were too late to influence the 1957-58 crops, but caused some early difficulties with the financing of the 1958-59 crops, particularly in Northern Rhodesia where a poor maize and tobacco season in 1957-58 left many farmers in debt. A Farmers' Debt Adjustment Act was passed to help the more indebted farmers over the current period.

The season was a difficult one for crop production. Planting rains commenced late and these were followed by exceptionally wet conditions during January and February, the season ending abruptly early in March. In parts the main crops suffered badly from water-logging and lack of sunshine and yields were consequently poor. Grazing and water supplies, however, were on the whole satisfactory throughout the year. Details of crop yields are given elsewhere in this report.

SURVEYS AND COST ENQUIRIES

The Economic and Markets Branch of the Ministry has been actively engaged on routine investigational work into farm costing and farm management problems. The reports on the investigation into the cost of producing maize on farms in both Southern and Northern Rhodesia and covering the crop years 1955-56 and 1956-57 became available during the year, and were used in determining the price payable for maize under the new long term agreement mentioned elsewhere in this report. Maize cost investigations are to be continued for a further two seasons.

A survey of the costs of producing tobacco in the 1956-57 season and involving 102 farms was also undertaken; this survey is being continued to cover the 1957-58 crop.

Milk production costs from some 65 dairy farmers in Southern Rhodesia and 20 in Northern Rhodesia are being collected in respect of the 1957-58 season and it is intended that this survey will run for a further two years.

Amongst various other investigations a survey of agricultural production methods was also initiated during the year. The intention is to analyse in as great detail as is conveniently practicable the methods of production employed by well-established, experienced and economically successful producers, with special reference to the seasonal utilization of resources: labour, draught-power and other working capital. This will require regular supervision and analysis of the records kept by the co-operators for several years. With limited staff the sample is necessarily small and is confined to the main cropping areas of Southern Rhodesia.

Growers of castor and kenaf have been sought specifically to assess the value of these as alternative cash crops.

From several years' accumulation of this data it is hoped to establish standards, or ratios in which resources are employed in profitable production. These should provide a sound basis for extension recommendations regarding potential diversification and for diagnosing probable weaknesses in unprofitable production methods.

The report on Agricultural Policy in the Federation of Rhodesia and Nyasaland which was prepared by the Federal Standing Committee on Agricultural Production in collaboration with Sir Frank Engledow, C.M.G., F.R.S., was published during the year. In the introduction to the report the Committee stresses the need for a co-ordinated agricultural policy in the Federation and points out in this connection that prior to Federation in 1953, agricultural policy was in the hands of three Governments on a territorial basis whereas the present position is that whilst the Federal Ministry of Agriculture is responsible for European agriculture in Southern and Northern Rhodesia with powers to fix prices and regulate the marketing and importation and exportation of agricultural produce over the whole of the Federation, the three Territorial Departments of Agriculture are responsible for the production policies of African agriculture—and in the case of Nyasaland of both European and African agriculture—besides exercising certain limited powers in regard to marketing and price fixing arrangements. In these circumstances, the Committee points out, the formulation of an overall agricultural policy for the Federation, acceptable to all four Governments, presents certain difficulties.

Moreover, a factor of great complexity in presenting a production plan or policy for agriculture in the Federation is the great difference in standard and methods, including costs, of European as against African production. In Southern Rhodesia the land has been apportioned more or less equally for European and African farming. In Nyasaland about 86.5 per cent. of the land available for agriculture is African Trust Land, and of the remainder only three per cent. is occupied by European agriculture. In Northern Rhodesia the Native Reserves and Native Trust Land comprise 94 per cent. of the territory, and European farming occupies about six per cent. Thus by far the greater part of the Federation is available for African farming. Certain specialized crops, such as flue-cured tobacco and tea, are at present entirely European enterprises, some others are almost entirely African grown, e.g. groundnuts and millets, and others, particularly maize and beef, are produced in large quantities by both groups.

In the report an extremely useful outline is given of the present position of agriculture in the economy of the Federation, the factors affecting agricultural production, and the present pattern of farming and a fairly detailed consideration is presented of those principles which the Committee feels should govern agricultural policy and the development of agriculture in the Federation over the next decade.

It is not proposed to recapitulate the various recommendations appearing in the report. It is of interest, however, to note that the Committee has called attention in the report to the need for substantial self-sufficiency in agricultural products as a proper aim for the Federation. This is an endorsement of the policy hitherto pursued in all three territories.

Detailed examination of the various recommendations in the report is being undertaken, by the Standing Committee, for the purpose of advising the Federal Ministry of Agriculture on priorities and action necessary to implement the Committee's proposals.

Of the more important recommendations the proposal that an Agricultural Research Council should be set up has already been accepted by Government and action is being taken to give effect to this recommendation.

CROP PRODUCTION

Maize. In Southern Rhodesia the acreage planted by Europeans in the 1956-57 season compared with 1955-56 showed an increase from 342,509 acres to 371,062 or 8.3 per cent. whilst final estimates of the acreage planted for the 1958 harvest were shown as 340,000 acres.

The 1956-57 European crop produced 3,777,021 bags or 10.18 bags per acre, both record figures, and in total 300,000 bags more than the previous year when a record yield of 3,434,697 bags at 10.03 bags per acre had been obtained.

In contrast the 1957-58 season was not as good; the late start to the rains reduced the crop and it is expected that deliveries to the Grain Marketing Board of both European and African maize will be below 3,000,000 bags compared with deliveries of 3,801,431 bags for the 1955-56 crop and 3,673,955 bags for the 1956-57 crop.

In Northern Rhodesia a similar position obtained. The 1956-57 crop broke all previous records, with total European production 1,247,491 bags from 123,551 acres, 10.10 bags per acre. This was in comparison with 1955-56, itself a record production at 956,000 bags from 106,458 acres. The yield record was also broken in 1956-57. In extreme contrast the 1957-58 season has been disastrous. Acreage planted by Europeans is estimated at 112,250 acres but an extremely bad season has reduced expected deliveries to 537,700 bags, or a crop of about 600,000 bags in all. The African crop is worse hit. In contrast with 1956-57 when over 700,000 bags were delivered it is expected that deliveries in 1957-58 will be about 40,000 bags, viz. it is forcasted that deliveries of both European and African grown maize will not exceed 600,000 bags.

In view of unfavourable forecasts of the maize crop prospects, the export of maize, which had been in progress during the preceding 12 months, was discontinued and the intake season opened on the 1st July with a carry over of 1,811,000 bags of maize on hand, i.e. approximately six months' consumption at Grain Marketing Board depots in Southern and Northern Rhodesia.

In view of the greatly reduced export programme it seems likely that the producer will receive for the 1958 harvest very nearly the full price of 41s. 6d. per bag which was guaranteed for internal sales.

The Southern Rhodesia Seed Maize Association produced a record crop and there should be ample seed for all requirements.

Three matters of major interest in pricing and marketing occurred in regard to maize in the year under review. A new maize price agreement was negotiated between Government and Rhodesia National Farmers' Union; maize marketing in Southern Rhodesia and Northern Rhodesia was placed on a Federal basis; and a major reduction in the subsidy was made by the Minister of Finance in his 1958 Budget speech.

Maize Price Agreement. The new agreement will apply to the 1959-60, 1960-61 and 1961-62 crops and will be subject to review each year with a view to extension for a further year. All maize required for the local market or for reserve stockholdings will be purchased from producers at 36s. 0d. per bag, excluding the sack, which is to be provided free of charge to producers, and this price will be subject to adjustment for cost movements as from a base date of 31st December, 1958, so, however, that no change shall be made in the price if the cost movement is calculated at less than three per cent. This level of prices compares with one of 44s. 0d. for the 1958-59 crop and something higher for later crops had the old agreement continued and represents in this respect a concession by producers. Maize not required for the local market or for reserve stockholdings will be exported at producers' risk.

The current maize price agreement was also modified in so far as the local market's requirements from the 1958-59 crop will be purchased not at 41s. 6d. per bag with producers buying the sack, but at 38s. 0d. per bag, excluding the cost of the sack, which Government has undertaken to provide free of charge to producers.

Now written into the agreement is a formal assurance that so far as possible the stocks of maize held by the Grain Marketing Board at the end of June in each year shall be approximately equivalent to six months' internal consumption requirement based on the previous three years' sales.

Federal Grain Marketing. Of major interest during the year under review was the passing by the Federal Parliament of the Grain Marketing Bill which

became law on the 1st January, 1958 and under which the Northern Rhodesia Maize Control Board and the Southern Rhodesia Grain Marketing Board have been amalgamated into one body with representatives from each territory on the Board. This Act provides for the extension to Northern Rhodesia of the system of grain marketing control hitherto applicable in Southern Rhodesia, and brings the same range of products in the North under pricing and marketing arrangements where formerly only maize was covered. The Act does not apply in Nyasaland.

The powers given to the Minister and to the Board are more flexible than under the previous territorial legislation. Included are special provisions for the implementation of the maize price agreement between Government and the Rhodesia National Farmers' Union, and other provisions allowing greater flexibility in the use of the Board's equalization funds.

Small Grains.—Kaffir Corn and Munga. Both these grains came under Federal marketing control from 1st January, 1958. In the case of Northern Rhodesia this is the first time that these grains have been the subject of Government marketing controls. The policy of determining producer prices for these commidities not wholly in relation to the maize price, but taking into account also relevant supply and demand factors continued for the 1957-58 crop.

In the case of munga, stocks held by the Grain Marketing Board were building up at the time of the annual price review early in 1958 and represented ten months' consumption requirements accumulated in the carry over stocks. Such a stock was considered excessive in relation to normal reserve requirements and the producer price was decreased by 2s. 6d. per bag to 31s. 0d. Deliveries have, however, been slightly lower than anticipated, whilst sales have increased and it became necessary to institute a form of rationing under which regular customers were restricted to purchases at the rate of 60 per cent. of last year's offtake. The Board estimated it would receive 80,000 bags of munga, all African produced. In the event deliveries for the five months to 30th September had amounted to 35,796 bags compared with 36,642 bags for the same period last year. Sales, however, have increased above the estimated 50,000 bags for the year and for five months to 30th September amounted to 49,640 bags of which Northern Rhodesia had taken 4,201 bags.

A similar position obtained in regard to kaffir corn—total deliveries of which were forecasted for the season at less than 50,000 bags. As compared with the previous year the producer price was increased by 1s. 0d. to 34s. 6d. per bag. The intake season opened with less than 17,000 bags on hand whilst deliveries to the 30th September were only 41,713 bags; sales during the same period were 33,315 bags in relation to expected sales for the year of 95,000 bags. A certain quantity of kaffir corn was imported to meet the demand for brewing grains.

Heavy stocks of rupoko continue to be an embarrassment to the Grain Marketing Board notwithstanding the fact that the producer price for this commodity has been reduced from 55s. 0d. to 40s. 0d. per bag, and deliveries to the Board have shown a considerable falling off compared with receipts during the previous intake season, whilst sales over the same period have shown a considerable increase.

Groundnuts. In common with the other products handled by the Southern Rhodesia Grain Marketing Board, groundnuts in the Rhodesias became a controlled product under the Federal Grain Marketing Board on 1st January, 1958; otherwise the existing marketing arrangements continued throughout the year without change. A new feature, however, was the introduction by the Grain Marketing Board of a scheme for marketing premium quality shelled groundnuts. Under these arrangements producers received an initial payment of 82s. 6d. per bag for first quality nuts for export, any profit resulting from export being distributed later; the scheme was only announced shortly before the intake season opened and the results of the few consignments exported overseas are not yet known.

During the year the price paid to the producer for groundnuts, other than premium nuts, was fixed at 79s. 0d. per bag, i.e. 4s. 0d. per bag less than last year, The crop season was a poor one and deliveries up to the end of September amounted to less than half of the original estimate of close on 200,000 bags for the 1957-58 crop and arrangements had to be made for the import of some 90,000 bags ex Moçambique and the Union of South Africa to supplement local production.

Beans have continued in short supply and deliveries to the Board up to the end of the season were less than 11,000 bags despite a rise in the producer price from 42s. 6d. to 45s. 0d.

Potatoes. The year under review has been an exceptionally difficult period for both producers and consumers in the Federation. Continued short local crops coupled with a drought in the main producing areas of the Union have kept supplies short for the greater part of the year. The attendant high import costs have resulted in local consumers often having to pay considerably more than the normal price for this commodity.

In the circumstances producers have had no difficulty in marketing their crops. The 1957 second irrigated crop was slightly smaller than normal and ran out about three weeks before the main crop was lifted. That crop in its turn again suffered from blight and only met about half the internal needs, as did the first irrigated crop of 1958. Import permits were granted freely throughout the year except for short periods of up to six weeks while the local crops were being marketed; the freely given permits, however, were of little use in the face of small offerings at high prices from the Union.

A more optimistic report than in previous years was given by those responsible for work on the control of Late Blight. In view of this, and the desirability of raising local production to meet requirements, the Agricultural Marketing Council recommended a producer price of 10s. 0d. per pocket, and that the price should be gazetted "per pocket" instead of "per bag". This price represented no price change in Northern Rhodesia and an increase of 9d. in Southern Rhodesia. Council also recommended that Government should explore every possibility for the more efficient marketing of potatoes through a central marketing agency.

Government was unable to accept the recommendation to raise the producer price in Southern Rhodesia, but agreed to gazette the price in terms of pockets as opposed to bags and also requested Council to conduct further enquiries into the possibility of a more efficient marketing system.

The seed potato position is now in a very much more satisfactory position than in the past. This is due to the amalgamation of the Eastern Districts Potato Growers' Association and the Salisbury Area Potato Growers' Association and also to the rigid standards laid down for certification.

Rice. There has been no change in the Federal Government's attitude to the protection of rice, the internal price of which has once again been guaranteed at £60 per ton f.o.r. Kota Kota. Once again, however, poor seasonal conditions have given rise to the production of a poor crop and approximately 60 per cent. of the total Federal requirements will have to be imported in the ensuing year.

Other Crops. Efforts continue in the search to produce a successful summer wheat which at the same time can be grown successfully in the irrigated lowveld areas.

There has been a great deal of interest shown in the growing of kenaf and it is anticipated that 2,000 acres will be grown in the pilot scheme. If reasonable yields are obtained this acreage should produce sufficient fibre for about 20 per cent. of the Federation's requirements.

Castor bean has also received a considerable degree of publicity but results so far have been disappointing due to damage to the crop by insect pests and disease. Work is, however, in progress in the breeding of better adapted varieties particularly for the lower rainfall areas of the Colony.

Tobacco. Although the season was a difficult one, with continuous heavy rain creating handling problems and leading to the spread of disease, it cannot be regarded as entirely unsatisfactory, though growers' profits have undoubtedly fallen. To some extent these decreased profit margins have been made up for by larger acreages.

For the season which ended on the 30th September, 1958 a total of 152,751,375 lb. of Virgina flue-cured tobacco was sold at an average price of 36.45d. per lb. realizing a total of £23,199,993. This compares with 144,285,536 lb. in 1957 at an average price of 39.73d. and a total realization of £23,671,511.

There were 2,965 growers in Southern and North Western Rhodesia during the 1957-58 season, an increase of 148 over the previous year, and 39 in North Eastern Rhodesia, a drop of eight from 1956-57.

The total acreage put down to Virginia flue-cured tobacco was 207,000 which was an increase of 22,000 over 1956-57. The average yield of 738 lb. must be

regarded as disappointing when compared with the previous year's figure of 780 lb., while the quality was generally poorer. Only 49.16 per cent. of the tobacco sold was leaf while 16.24 per cent. was nondescript. This compares unfavourably with the previous season when 53.6 per cent. was leaf and 10.1 per cent. nondescript.

The demand for all grades of ripe lemon, orange and mahogany leaf was strong and prices remained higher throughout the year than they were in 1957. The prices of all other types of tobacco, especially the "slaty" off type, were weak and prices were lower. Prices of all types fell heavily towards the end of the season.

Fire cured tobacco sales in the Rhodesias continued to fall and only 86,106 lb. were sold at an average price of 12.36d. as compared with 342,482 lb. in 1957.

The first sale of burley tobacco in the Rhodesias was held in Salisbury, 18 growers sending in tobacco. Although the average price of 16.47d. paid for the 32,160 lb. offered for sale cannot be regarded as high it should be borne in mind that it was the growers first experience with this crop.

Active interest continues to be shown in Turkish tobacco production, but the season has been poor and deliveries of both the Samsun and Soulouk types are expected to be only about half of what they were for last year. The Soulouk type of tobacco which has been delivered so far, has, considering the season, been satisfactory and the average price per lb. is expected to be about 3s. 3d.

Adverse weather conditions extended to North Eastern Rhodesia where production has continued to fall. Total sales of Virginia flue-cured tobacco were 1,063,912 lb. which realized £122,877 at 27.72d. per lb. This compares with the previous year's figures of 1,282,921 lb. which realized £164,273 at an average price of 30.73d. In an effort to assist growers in the area the Federal Government decided to subsidize the North Eastern crowers of flue-cured tobacco—on the basis of pre-sales classification—up to the price they could expect to receive for the same grades of Southern Rhodesian and North Western Tobacco on the day of sale.

Burley tobacco was produced in considerable quantities for the first time in the North Eastern Province and 550,004 lb. were sold on the Limbe floors at an average price of 22.15d. per lb.

Although the Federal Government does not control the marketing of Nyasaland tobacco, it is of interest to note that Nyasaland offerings of Virginia flue-cured tobacco have declined still further and 2,177,872 lb. were sold at an average price of 22.60d.

Nyasaland sales of dark fire cured Virginia were: Southern Division, 3,378,738 lb. at 16.77d. per lb. and Northern Division, 27,276,549 lb. at 15.58d. per lb. Nyasaland also sold 2,500,861 lb. of sun cured Virginia tobacco for an average of 22.84d. per lb. and 3,200,582 lb. of burley at 22.84d. per lb.

The United Kingdom continued to be the largest purchaser of the tobacco crop absorbing 51.0 per cent. of Virginia flue-cured production. The following are the distribution of exports:—

SOUTHERN AND NORTH WESTERN RHODESIA

	lb.	%
United Kingdom	77,933,692	51·03
Australia	10,727,316	7·02
Local Market	13,365,100	8·75
Other Markets	50,699,354	33·19
Unallocated	25,913	·01
	152,751,375	100·00

NORTH EASTERN RHODESIA

	lb.	%
United Kingdom	505,526	47·52
Australia	—	—
Local Market	181,278	17·04
Other Markets	377,108	35·44
	1,063,912	100·00

United Kingdom purchasers went short by some 7,000,000 lb. as the better and standard grades which they were anxious to obtain were not available. It is obviously desirable that every effort should be made to satisfy their requirements.

Australia increased its purchases over the previous year by 1,250,000 lb. while exports to the Union of South Africa showed no change.

One of the most significant features of tobacco sales has been the increase of some 5,000,000 lb. of tobacco sold domestically, an increase absorbed almost entirely by Africans.

Horticulture. Continued expansion took place in the horticultural industry with increased production of fruit and vegetables both for fresh consumption and processing.

Plenty of scope still remains for extending production towards a greater measure of horticultural self-sufficiency.

Improved management was noticeable particularly with the growing of vegetables and citrus fruits.

While home production increased so also did importation. Fresh fruit alone reached a new high level of £706,292 value, following last year's total of £494,986. Bananas were mainly responsible for much of the increase.

Heavy and continuous rains in January and February seriously interfered with vegetable growing, and supplies had to be imported from the Union to make up the shortfall.

Marketing problems were few and easily solved. During the year the new Salisbury Municipal Market was opened and is proving a success. Much more produce can be handled and more buyers attended.

The visit of a coffee expert from Kenya was welcomed and proved of great value to guide the young coffee industry, which now has 77 acres planted.

CATTLE, SHEEP AND PIGS

National statistics indicate a well sustained expansion in cattle production over the past five years and a record number of cattle came on the market during the year under review. Imports into the Federal area were restricted to 12,000 head compared with 14,000 head last year and 40,000 head the year before.

It would seem that the Federation has very nearly reached self-sufficiency in beef production under present levels of consumption and that markets may have to be developed for a small surplus, if present trends of production persist. Prospects in this connection appear to be favourable in such products as canned beef, frozen boneless beef and small quantities of high quality chilled beef to certain African territories. However, it is also possible that with greater industrial development and improvement in the purchasing power of the rapidly increasing overall population the demand for beef will again overtake supplies in the near future. There seems to be little doubt that the provision of guaranteed prices and a stabilized market over a reasonably long period has given confidence to producers to expand production, although the effect of good seasons which have unquestionably contributed to early attainment of this objective should not be disregarded as also the effect of better systems of management and increased supplementary feeding. Supplies have been successfully regulated to come forward during the year and rationing of beef during certain seasons of the year has become a thing of the past.

The Cold Storage Commission substantially increased its turnover in cattle during the year and expanded its markets for beef both within and outside the Federation.

Production costs rose by rather more than one per cent. during the year and producers were entitled to this increase in their price under the existing long term agreement; the Rhodesia National Farmers' Union, however, agreed to forgo this increase and no price change took place.

The Northern Rhodesia butchers have agreed to buy from the Cold Storage Commission all their requirements of slaughter cattle or beef which cannot be supplied from their own territory or which may be imported from the Caprivi Strip and the Panda-ma-Tenka area in Northern Bechuanaland or from that portion of Ngamiland from which cattle have in the past been traditionally routed to Northern Rhodesia. This is an important departure from their past practice which was to import all their requirements direct from Bechuanaland.

The Cold Storage Commission has started business in Nyasaland in a small way. Refrigerated trucks of beef are sent from Umtali and a "sales manager" has been stationed in Nyasaland to dispose of it. The Cold Storage Commission will be building their own works in Nyasaland and should be in full operation by the beginning of 1960.

A greater interest in sheep has been stimulated by the formation of a sheep breeders' association and imports of mutton have been reduced to encourage local production.

Production of pigs in both Southern and Northern Rhodesia has shown a marked increase over the past 12 months and resulted in a substantial reduction in imports.

The Colcom Products Central Co-operative Ltd., a subsidiary of the Rhodesia National Pig Breeders' Co-op. Co. Ltd., was responsible during the whole of the period for pig marketing in Southern Rhodesia and continued to carry out the active sales policy it inherited from the Cold Storage Commission. New products were also in evidence and it is understood plans for new manufacturing facilities are in train.

During the year new pig prices together with new grades came into effect. The three grades of cutter pigs were eliminated and substituted by a new cutter grade and a lightweight baconer grade. The range between minimum and maximum prices was also increased to allow greater manoeuvrability of buying prices by the Co-op.

Exports of pig products from the Federation have been stepped up in recent months with the United Kingdom being the main customer for hams and Portuguese East Africa for bacon. The value of exports from October, 1957 to July, 1958 (latest available) were £132 for pork; £3,352 for bacon and £86,049 for hams, of which £47,090 were exported during June and July. Exports have fallen off in the last two months. The prices received in the United Kingdom have not been economic but it has been a question of disposing of stock. The hams have been well received.

Pig marketing in Northern Rhodesia was somewhat confused during the latter half of the year. Producers there appeared to be dissatisfied with the arrangements made for the handling of their pigs and during April, 1958 a Pig Co-operative was formed which has now been granted membership of Colcom Central Co-op.

DAIRYING

Dairy production continued to increase and it is apparent that dairying is assuming an increasing importance in agricultural production. The increase in production of milk is reflected mainly in the increased supplies to the Dairy Marketing Board in Southern Rhodesia and the Co-operative Creameries of Northern Rhodesia Ltd. In Southern Rhodesia the increase in supplies of whole milk to the Dairy Marketing Board exceeded the increase in whole milk sales while in Northern Rhodesia increase in supplies was approximately equal to the increase in whole milk sales. The surplus in both territories was mainly used for cheese manufacture but a substantial quantity of skim milk powder was produced in Southern Rhodesia and in both territories sales of skim milk to Africans are increasing. New sterilized milk plants were installed at Lusaka and Bulawayo and both sterilized milk and sterilized flavoured skim milk is being produced at these centres.

Butter and cheese production were slightly higher than in the previous season, the increase in butter production deriving from the separation of milk by the main dairies for the production of skim milk for sale to Africans and skim milk powder.

Whole milk consumption continues to increase and there is a definite increase in sales of skim milk. Cheese consumption is increasing but it appears that butter consumption has fallen slightly due possibly to competition from margarine.

There was no change in butterfat prices during the season but the retail price of butter was reduced by 1d. per lb. from the beginning of January, 1958. Cheese prices remained unchanged until the 26th September, 1958, when retail prices in Southern Rhodesia were raised by 1d. per lb. thus increasing the retail margin. The only change in retail milk prices was an increase of 1d. per pint in Northern Rhodesia at the end of August.

During the whole period differential milk prices were in operation. Guaranteed producer prices for milk sold as whole milk plus a safety margin of 83,333 gallons a month were 50d. per gallon October-November, 1957, 36d. per gallon December, 1957-February, 1958, 46d. per gallon March-June, 1958 and 50d. per gallon July-September, 1958. However, at the price review held this year an alteration in the amount of the safety margin took place which resulted in the monthly figure of 83,333 gallons being reduced to 62,500 gallons. This came into effect on the 1st April, 1958 with no change in the basic producer prices. Due to the reduction of the maize subsidy in the last Federal budget milk producers were given an additional 1d. per gallon on their basic prices to offset increased feeding costs.

This increase came into effect on the 1st July, 1958. Milk in excess of whole milk requirements plus the safety margin is paid for at its net realization value which is approximately 21d. per gallon.

The effect of this price policy has been to reduce the monthly pay-out to producers to the following extent:—

	Guaranteed Basic Price/gallon	*Actual Pay-out to Producers*
1957		
October	50.0d.	43.4d.
November	50.0d.	41.7d.
December	36.0d.	30.2d.
1958		
January	36.0d.	30.1d.
February	36.0d.	32.2d.
March	46.0d.	41.3d.
April	46.0d.	41.3d.
May	46.0d.	41.0d.
June	46.0d.	41.7d.
July	51.0d.	44.9d.
August	51.0d.	43.8d.
September	51.0d.	42.4d.

It is of interest to note that in 1952-53 the average overall pay-out to producers was approximately 3s. 4d. per gallon and although this figure has since been raised to 46.5d. per gallon for milk actually sold as liquid milk plus the variable "safety margin" the overall pay-out, due to the operation of the differential price system has remained at approximately 3s. 4d. per gallon. Quality premiums averaged about 1d. per gallon in addition.

POULTRY

Generally speaking poultry and eggs have been in fair supply. There was a rather prolonged shortage of table poultry during the months May-July but for the rest of the year supplies have been adequate. Most retailers increased their price for table poultry by 6d. per lb. in July. There was a shortage of eggs during the winter with prices rising to 6s. 4d. per dozen on the Salisbury Municipal Market.

No change from the free enterprise marketing of poultry products has occurred. The Agricultural Marketing Council took evidence on grading requirements for poultry products, recommending in its report a voluntary scheme of grading based on the National Mark basis which is now under consideration.

Imports have been controlled under permit and comprise only table poultry and day old chickens for Northern Rhodesian markets. Exports of all products to neighbouring territories have increased. Production of eggs has increased, but prices have not advanced. Owing to the risk of disposal of stored eggs, neither chilled nor pulp eggs have been stored to any extent. Surplus production at low prices has been directed to urban African consumption.

Sales of eggs are less during the high production, low price, period than when in shorter supply and when prices are higher. This unusual position is due to backyard summer production which in the Federation is very high compared with other countries and is the main cause of wide price fluctuations and the marketing difficulties of the genuine producer.

Production of table poultry has increased spectacularly to the extent of double the numbers and treble the value in two years.

Processing facilities for table birds have improved in the major centres, and quality of product also.

The numbers of all classes of poultry have increased in both Southern and Northern Rhodesia, but apart from table poultry of the "broiler" type prices have not increased for eggs, day old chicks, or other poultry.

The removal of the subsidies on maize and small grains in July resulted in a five per cent. increase in feed costs, which are now not far below those in European countries.

The value of all poultry products sold in the Federation amounted to £968,648, from those rendering returns, which excludes many small producers.

RESEARCH STATIONS

Very useful work continues in progress at the various research stations. At Grasslands Research Station, Marandellas, which serves the agriculture of some 12,000,000 acres of sandy country in North Eastern Southern Rhodesia the

emphasis was on studies of grassland management, these being based on measuring the effect of various treatments on the growth, dry matter yield, and protein and carbohydrate content of the shoots and roots. Comparisons of the more promising grasses for yield and response to nitrogenous fertilizers have been continued.

With legumes, numerous varieties of lucerne, dahl, groundnuts and soya beans have been compared and observed.

With maize, experiments in weed-control with herbicides and by cultivation have been continued, and study of the long-term effects of various forms of nitrogenous fertilizer for maize has been started. A new herbicide "Simazin" appears particularly promising against "Rapoko Grass", one of the worst of sandveld weeds.

With livestock, a test of the nutritive value of salt for steers on natural grazing has been completed, with no evidence of any increase in weight from its use. Studies of effects of nutrition on infertility in Afrikander cows on natural grazing, and of seasonable conception in Mashona cows have been continued.

In studies of soil productivity, five long-term experiments were continued according to plan. In one of them, where a ploughed-up ley was test-cropped with maize for the third season running, the yield *without fertilizers*, in a poor season for maize, was 11 bags per acre—some indication of the value of grass leys on sandveld soils.

In comparing concentrates for milking cows on irrigated grass/clover pasture it has been found that maize meal is an adequate concentrate—the clover in the pasture making a protein concentrate unnecessary.

Details of the work at the Henderson Research Station are given in the report of the officer-in-charge. Of considerable interest is the fact that despite a somewhat unfavourable season, the 300 acre experimental intensive farm unit achieved a gross income of £7,000 from 25,000 gallons of milk sold, 590 bags of maize, grass seed and natural increase of dairy stock with a small profit of £1,000 after paying £500 in rent. It has been possible also to produce beef steers with a live weight of 1,000 lb. and over at the age of two and a half years whilst an important project to investigate the possibilities of seasonal milk production has been initiated and the basic dairy herd pastures and facilities have been established.

In the Fisheries Centre work is proceeding along lines of consolidation of existing undertakings and extension of new projects, basic and applied research being carried out at the Research Centre. Experimental fishing surveys on Lake McIlwaine have been undertaken whilst stocking experiments in ponds and dams in different parts of the country are being continued.

The Matopos Research Station experienced an unusually short season but the programme of dry land agronomy continued with investigations of spacing and fertility requirements of maize and sorghums and with silage and hay crop comparisons of yield, spacings, field losses and feed value. An extensive country-wide castor bean programme was also conducted to compare varieties and fertilizer requirements of the crop. The plant breeding programme continued along the lines of producing synthetic varieties of maize and converting the white Rhodesian hybrids to yellow. Veld management trials and veld burning experiments have been continued with some interesting results and this applies also to the veld fertilizer and chemical bush control experiments. On the animal side the problem of reducing the high costs of milk production is being investigated, whilst amongst other projects large scale experiments are in progress to determine the differences in the cost of beef production between the rearing of cattle on free range as opposed to the wintering of stock on high quality home grown feeds. Experiments are also in progress to determine how sheep production can best be integrated with the rearing of beef stocks.

At the Sabi Valley Experiment Station the year has seen a change of organization to allow for continuation and expansion, in both field and laboratory, of the fundamental work on water requirements and on soil physical conditions.

Fertility and land preparation experiments were undertaken with maize whilst maize breeding and selection work continued on a reduced scale. Some exceptionally high yields of the order of 4,000 lb. of seed cotton were recorded in the breeding and selection work. Some satisfactory yields were also recorded for wheat and barley—although these crops were considerably damaged by rats and queleas—and much information of a research nature obtained. Over 100 selections of wheat were planted for seed increase or further selection. Last year's selections

showed a high degree of rust resistance and it can be said with some confidence that *stem rust* is no longer a major limiting factor to production at Sabi.

Field work continued on bananas, pineapples and fibre crops other than cotton and exploratory trials were put down on groundnuts, dahl, castor bean, potatoes and beans.

At the Gatooma Research Station cotton yields in 1957-58 confirmed, once again, the great importance of early planting and germination. Cotton which had germinated by 25th November yielded 950 lb. seed cotton per acre compared with 550 lb. from cotton grown under similar conditions, except that, in this instance, germination was delayed until the 12th of December.

Not only is an early "get-away" of the crop important, but adequate soil fertility and the application of insecticides are necessary. Where fertility was in question, but with insecticide applied, a meagre 410 lb. of seed cotton per acre was harvested; where there was good fertility and no insecticide treatment the yield was only 183 lb. seed cotton per acre.

Cotton Plant Breeding. Progress is being maintained in making selections for high blackarm and jassid resistance in conjunction with high yields and an improvement in lint quality, acceptable to the Gatooma Mills. Albar 637, which so far possesses most of the desired characters (although jassid resistance is variable and seed maturity is under investigation), will be tested in the country-wide District Variety Trials in 1958-59.

With regard to cotton insect pest control, results of trials conducted over the last two seasons indicate that the most promising method, at present, for increasing cotton yields is by spraying regularly, over a period of about two months during flowering, with Endrin. For this method of control to be both economic and effective, it is essential that high potential yield per acre should be assured, by the application of sound agronomic practices. Early sowing, thinning and weeding, good plant stands and a high level of soil fertility are all of paramount importance.

A Farm-scale Insecticides Trial, the component parts of which were situated on several farms in the Gatooma-Hartley district, has yielded considerable agronomic and entomological data, the value of which will increase with a continuation of the trial over a number of seasons.

Generally, however, the results of the 1957-58 insecticide trials were inconclusive, and this was often due to both climatic and agronomic factors retarding plant development and therefore potential yield.

GWEBI AGRICULTURAL COLLEGE

Gwebi Agricultural College continues to be well supported. Since the College opened in 1950, 80 per cent. of those students who sat the First year Final Examinations have passed into the Second year. This year the figure was 90 per cent., indicating the growth of tradition where application to work in the first year is concerned.

The number of First Class Diplomas and Distinctions in various subjects indicates an increased desire to do outstanding work, and the incentive provided by the availability of the First Class Diploma.

Basic work with planted pastures on the College farm now makes it possible to go forward with re-planning the south side of the College farm, using modern farm planning methods as a guide.

The successes obtained with College Herefords and Frieslands at several Shows indicate the quality of these livestock herds.

The College Dairy herd was fifth in milk and sixth in butterfat in the 1955-56 Annual Milk and Butterfat Competitions.

Useful experiments studying fertilizing of maize, following a managed grass ley, on heavy soils, have been carried out.

The development of research in the Engineering Section is at present handicapped by lack of funds, but useful work is in progress concerning sources of power (other than imported fuels) and engine efficiency.

CHEMISTRY

The Chief Chemist reports that despite a considerable number of staff changes the general output was satisfactory, the total number of samples analysed (7,130) being only slightly lower than for the preceding year (7,276). The individual sections contributed to the number of samples analysed, as follows:—

General Section	1,904
Soil Testing Section	3,393
Research Section	1,833
Total	7,130

Considerably more attention than in previous years has been paid to the official control of fertilizers and farm feeds, not less than 115 samples (mainly farm feeds) having been analysed under the Act. In connexion with the incidence of aphorphorosis in Matabeleland, the Section has co-operated with the Veterinary Department and the Matopos Research Station by analysing 642 specimens of blood, most of them for inorganic phosphorus. Monthly samples of rainwater were collected and dispatched to the United States of America Atomic Energy Commission for determining radioactive fall-out.

In the soil testing section 3,754 soil samples were received during the year, as compared with 3,095 for the preceding year. Three thousand three hundred and ninety-three samples were reported upon, of which 2,647 were advisory samples and 746 research and investigatory. Of the advisory samples 51 per cent. were from lands to be planted to flue-cured tobacco and 24 per cent. from maize lands. Eighty-seven per cent. of the advisory samples were submitted by Southern Rhodesian farmers and 12 per cent. came from Northern Rhodesia.

The Soil Survey team which has again been built up to a unit of four soil chemists carried out a broad reconnaissance survey of the Southern Rhodesian area of the Zambezi Valley below Kariba Gorge as far downstream as the Reckomitje River. On account of unexpected practical difficulties the survey had to be carried out on a broader and less detailed basis than was originally planned, but the detail mapped should be sufficient to provide a clear picture of the main soil types, their distribution and irrigation potential, and to serve as a basis for broad land-use planning.

In the research section the scope of the work has been widened to include studies on the breakdown of soil organic matter and on soil moisture, and a start has been made with investigations on minor elements. One thousand one hundred and eighty-seven pasture research samples have been analysed, including 565 samples for digestibility trials, 74 lysimeter leachates and 58 samples connected with aphosphorosis investigations. The work on the effect of green-manure at the Salisbury Agricultural Experiment Station was continued as were the investigations on the release of nitrogen from soils at Grasslands and the Salisbury Experiment Station, where grass covers had been ploughed in. New apparatus has been installed, and both carbon dioxide and nitrate formation in soils can now simultaneously be followed, giving a more complete picture of the break-down or organic matter in soils. Other investigations carried out during the year were concerned with such diverse subjects as the measurement of moisture tension in soils and of evapo-transpiration losses under irrigated winter wheat, studies on the nutrient uptake of tobacco, chromium and nickel toxicity of Dyke soils, methods of determining available soil nutrients, and a number of minor investigations.

ENTOMOLOGY

The Chief Entomologist reports that steady progress has been made in entomological matters.

The increased interest being taken in castor beans as a cash crop drew attention to the many insect pests to which this crop is susceptible. In some cases very serious damage was caused and yields were consequently much less than anticipated.

Good progress was made with the helminthological survey of Rhodesia and a little information has been obtained in respect of Nyasaland. Much of this information has been obtained because of the ready co-operation of officers of the Northern Rhodesia Department of Agriculture, the Department of Conservation and Extension and the Southern Rhodesian Department of Native Agriculture as well as of members of the farming community. More attention was paid to the

dangers of spreading eelworm infestation by means of infested nursery stock and because of heavy infestations two nurseries were placed in quarantine.

Towards the end of the period the Plant Pests and Diseases Act, 1958 was passed by the Federal Government. All regulations and orders dependent on this Act have now been prepared and their publication is unlikely to be much further delayed. Uniformity in the treatment of most phytosanitary matters, particularly in relation to plant imports, will then have been achieved throughout the Federation.

Complete inspection of tobacco premises in Northern Rhodesia and Southern Rhodesia was again achieved. The policy of inspecting town warehouses and similar premises several times annually was continued.

The International Red Locust Control Service has again had a successful year despite the resignation of several of its more experienced professional staff whilst a satisfactory year's working has also been reported by the African Migratory Locust Control Organization.

BOTANY AND PLANT PATHOLOGY

The Chief Botanist and Plant Pathologist reports that the enthusiasm shown by farmers and smallholders in the possibilities offered by seed crop production has not abated in the least. On the contrary requests for information and advice have been overwhelming and nearly 300 visitors called at the Seed Testing Laboratory in the course of the year. The new industry has expanded rapidly in all directions, certified grass seed production increasing from 50,000 lb. in 1956-57 to 80,000 lb. this year whilst the area under vegetable seed crops rose from 108 to 476 acres. Flower seed crops also entered the picture for the first time. No less than 583 acres of seed potatoes were entered for certification. A Rhodesia Tobacco Seed Association was formed for which the branch will also be responsible for providing the inspection and certification services.

The Herbarium collection rose by more than 10 per cent. to some 88,600 specimens and is now recognized as one of the most important collections in Africa. The number of specimens sent in from the two Northern Territories increased sharply being treble that of the previous year. Valuable collections were also received from Bechuanaland. Much of this material is proving helpful to the Flora Zambesiaca project which continues to make satisfactory progress.

The overall pattern of disease amongst major crops was largely determined by weather conditions during the summer period. November and December were unusually dry and hot whereas the following two months were exceptionally wet and were accompanied by serious outbreaks of disease in certain crops, notably tobacco and potatoes.

Tobacco anthracnose again developed extensively in both Virginia and Turkish seedbeds. It appeared for the first time in Nyasaland where the cause was traced to infected Virginia type seed introduced from Southern Rhodesia. The seed-borne nature of tobacco anthracnose was confirmed in the laboratory. These observations have led to a tightening up of seed production methods and have encouraged the formation of the Tobacco Seed Association previously mentioned. Wildfire, angular spot and white mould were all troublesome during the difficult 1957-58 season.

Summer and first irrigation crop potatoes suffered from late blight, substantial losses being experienced amongst susceptible varieties. The disease was again widespread on tomatoes causing heavy damage to the summer crop. Late blight persisted on tomato until the end of July in some parts of the country. Blackleg occurred in most first irrigation potato crops grown from imported seed.

A survey of commercial and experimental castor bean crops revealed numerous diseases, two at least of which are new to the Federation. The rapid expansion of kenaf production has also demonstrated the possible hazard of diseases such as anthracnose tip blight and stem break to the successful cultivation of this crop.

Long term investigations were continued on disease problems of maize, wheat, potatoes, legumes, fruit and vegetables.

Investigations were also conducted on several problems including seed-borne diseases of castor bean, tobacco and maize; the comparative behaviour of maize inbreds and hybrids towards infection by ear-rotting fungi, as well as further seed dressing trials on maize, sorghum, and wheat.

Methods were devised for separating ergot contaminants from munga and bulk samples of munga grain containing known amounts of ergot prepared for the Veterinary Research Laboratory in connexion with investigations on agalactia in pigs.

CONSERVATION AND EXTENSION

Good progress was made in all aspects of soil and water conservation. The protection of arable lands remained reasonably satisfactory, improvement in the cultivation by Africans on European farms was brought about, and road alignment and drainage on farm, Road Council and main roads showed considerable improvement. It is also gratifying to report improvement on the application of sound systems of veld management, control of veld fires and interest in the prevention of bush encroachment. Good progress was also made with the protection and management of the catchments of some of our most important rivers and in particular in the catchment of the Sabi River where a special team was at work.

The Erosion Control Research being carried out by the Department at the Henderson Research Station continued to provide most valuable guiding information.

In so far as water conservation is concerned the Department advised on, and was either directly or indirectly responsible for the construction of 361 dams in Southern Rhodesia and 58 dams in Northern Rhodesia. These figures show an improvement over the previous two years.

The development of irrigation remained steady although expansion was not as rapid as it should have been. There was, however, a marked improvement in standards of water, soil and crop management. The most spectacular and extensive development in irrigation during the year was at the Triangle Sugar and Hippo Valley Citrus Estates.

Planning at regional, catchment and farm levels was given the highest possible priority and as staff became more experienced output increased very considerably. This aspect of our work is looked upon as the most important and fundamental of all.

Close and fruitful co-operation was maintained with the Natural Resources Boards of Southern Rhodesia and Northern Rhodesia as well as with Intensive Conservation Area Committees, farmers and the numerous Boards and Departments of the various Governments concerned directly or indirectly with different aspects of conservation.

Officers of the Department carried out many thousands of visits to farmers for the purpose of advising on a great variety of problems. The visits were greatly appreciated by the farming community and, in spite of the extensive assistance given, officers could not nearly meet the demand.

For the first time the Department was in a position to give farmers sound assistance and advice in the increasingly important fields of farm mechanization and farm building construction and layout.

Numerous field days were also held where matters of interest were discussed with farmers. Newsletters were also sent out via the Intensive Conservation Area Committees and articles were published in the popular Press.

Great importance was placed on Conservation Education as applied in schools and co-operation with the Federal Ministry of Education and Natural Resources Boards in Southern Rhodesia and Northern Rhodesia in this field was strengthened. Short courses and one-day outings for teachers were organized for the purpose of stimulating interest in this important work.

The Young Farmers' Clubs movement made steady progress although the shortage of organizers was felt. Every possible assistance was given to Clubs by field staff and voluntary helpers. Special training courses for Club Leaders were also run.

Good progress was made at all the Experimental Farms and they served a most useful purpose, both directly and indirectly in the areas covered by them.

Intensive Conservation Areas Committees and farmers remained closely connected with the farming and experimental programmes of these farms. This close liaison has proved of very great value indeed.

VETERINARY SERVICES

Foot and Mouth Disease again caused anxiety in Western Matabeleland. The extensive outbreak, which necessitated the use of a military cordon, was brought under complete control by the end of 1957 after 94,463 head of cattle had been inoculated. A small outbreak occurred in the extreme north-west corner of the Colony in March and owing to its isolated nature was rapidly controlled. A further outbreak developed in August in close proximity to the extensive area previously involved. As in the previous case introduction of infection was attributed to the dense concentration of game in the Wankie National Park. Steps are in progress to minimize the risk of similar spread of infection from game to cattle by erecting a game fence to the south and east of the Wankie National Park.

Trypanosomiasis incidence has shown a marked increase but the use of curative and prophylactic drugs, of which there are now many useful types, has succeeded in curtailing losses from this disease to a minimum.

Constant supervision and treatment of cattle in the danger or threatened areas is maintained.

Experiments with prophylactic drugs of various types are in progress in the Manjolo and Kariangwe areas to which Africans from the Kariba basin had to be evacuated with their stock. Despite the heavy fly challenge to which these animals have been exposed losses from all causes have been minimal due to the constant veterinary supervision that has been afforded them.

Outbreaks of other scheduled diseases have been kept at a very low level, notably those which are tick-borne. This is attributed to the closer attention which the Department has been able to devote to tick control. Rabies incidence shows a slight decline but cases of apparent failure of the vaccine to produce immunity have occurred and investigations are in progress, in collaboration with the United States Research workers, to account for them.

There has been a satisfactory reduction in the incidence of Contagious Epididymitis and Vaginitis ("epi-vag") but another cause of sterility, vibriosis, is making its presence felt.

Considerable progress in the Tuberculosis Eradication Scheme can be recorded. More than half the dairy cattle population are now under regular test—one valuable herd with an extremely high incidence of infection was slaughtered under the compensation scheme.

Agalactia (mammary hypoplasia) in swine, which had had serious effects on the pig industry in previous years, was minimal. The cause was proved to be the feeding of ergot infected munga.

Internal parasites of cattle and sheep have received special attention and good progress in getting farmers to practise proper management and anthelmintic treatment can be recorded.

A new Artificial Insemination sub-centre was established at Gwelo. Initial support was disappointing but it is expected to increase.

TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION

The disquieting appearance of nagana on the Chiredzi Ranches in July was associated with a continued movement of tsetse west of the Sabi River. At the same time an extensive advance took place south of the Lundi River. Professional and field staff in the area was increased and a revised outline plan of operations produced. Meanwhile the protection of cattle over a wide area, by antrycide, continues to be most effective.

In the Zambezi tsetse belt, however, the position has further improved, especially in the Urungwe Area.

In order to bring about closer integration of anti-tsetse operations with local development schemes, a number of local Trypanosomiasis Control Committees have been set up under the chairmanship of Native Commissioners.

REPORT OF THE DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES FOR THE YEAR ENDED 30th SEPTEMBER, 1958.

DR. B. S. ELLIS
DIRECTOR OF RESEARCH AND SPECIALIST SERVICES

This introductory section deals with Departmental matters or matters of special interest to which attention is drawn. Then follow 14 sections, arranged in alphabetical order, dealing with the Specialist Branches and the Stations (including Gwebi Agricultural College) respectively and covering in some detail the very wide range of interests and activities embraced by the Department.

Horticulture is at present a sub-Branch under the direction of the Chief Agriculturist, under whom also fall directly the Agricultural Experiment Station, Salisbury, and the Panmure Hybrid Maize Station at Shamva. The Melsetter Pasture Station falls under the Chief Pasture Research Officer. Accounts of the work in progress at the Nyamandhlovu Pasture Sub-Station and the Tuli Pasture Sub-Station are given in the report on the Matopos Research Station.

STAFF

Mr. R. R. Staples retired from the post of Director of Research and Specialist Services in December, 1957. Mr. T. K. Sansom, Chief Agriculturist, who with Dr. B. S. Ellis had been carrying out Mr. Staples' duties as Director while Mr. Staples finalized the report of the Federal Standing Committee on Agricultural Production, was appointed to act as Director and continued to act until the beginning of June when the present appointment was made.

There was a general easing of the position as regards recruitment and at the end of the year under report almost all important posts except that of Biometrician had been filled or were to be filled. The failure to fill the post of Biometrician has handicapped the work of the Department: it is hoped that the post will be upgraded and will attract suitably qualified applicants. It is also hoped to fill two important new posts created this year—Chief Horticulturist and Plant Breeder at the Salisbury Station, at an early date.

Resignations from the Department were few.

The general situation is indicated in the following table:—

Establishment.	
Superscale posts	12
Senior professional Officers	30
Professional officers	58
Technical officers	93
Clerical officers	27
Graded African posts	67
Contract post	1
Total number of posts	288
Resignations. 1957/58	
Professional officers	7
Technical officers	9
Transfers. 1957/58	
Professional officers	5
Technical officers	3
Officers appointed. 1957/58	39
Vacant posts. 30/9/58	7

DEPARTMENTAL CONFERENCE

No Conference was held during the year, but a very ambitious one has been planned for next year. Papers have already been arranged and are being prepared well in advance.

COTTON INSECT PESTS

The research scheme on the control of insect pests, particularly Red Bollworm and Stainer, which is financed jointly by the Federal and Nyasaland Governments and the Colonial Development and Welfare Fund, is progressing favourably, and the team was brought up to full strength during the year by the appointment to Gatooma of the third entomologist. Proposals have been submitted for the extension of the scheme for a further period, and for its expansion.

RESEARCH

The very wide range of problems encountered in agriculture in a comparatively new country produces innumerable fields for research and investigation. Work on these lines continues to be pursued as vigorously as staff, funds and facilities permit. While it is true that there are many detailed problems or many facets of larger problems which have not yet been resolved, it is equally true to say that a very realistic approach has always been made, and that most problems of immediacy, of critical economic importance, or of vital fundamental concern have been given attention. In those fields in which officers of the Department have been able to devote their major efforts, the standard of work in this country is as high, not relatively but absolutely, as anywhere in the world. The fact that visiting scientists of eminence in their several walks of life, who visited the stations and laboratories of the Department during the year, were impressed with the standard of knowledge, efficiency and purpose of the officers they met, is a tribute not only to the scientists themselves and to the policy of the Ministry, but to the opportunities for travel in recent years. There can be little doubt that the facilities for research investigations in other countries, made available by the United States through its I.C.A. programme, and by F.A.O., in an unparalleled gesture of help, have greatly increased the knowledge, the skill, the authority and the confidence of all those who have been fortunate enough to participate, and have made them aware of the high standards which have been built up here.

Another development of the past year which followed from the visits of scientists from overseas, is that requests have come in from some of the foremost institutes on the Continent of Europe for facilities for their scientists to study at our stations and in our research laboratories.

Among those fields of agricultural research which require fuller and more fundamental investigation are many aspects of horticulture, animal nutrition and soil science, to name only a few, and there is real need for intensified work on soil physics, microbiology and plant physiology.

ORGANIZATION OF RESEARCH

The integration of the research activities of all the Stations (including Gwebi Agricultural College) and the specialist branches, and the funnelling of research findings to the advisory and extension Services, are probably the most important functions of the Director of Research and Specialist Services. To assist him in these difficult tasks there was constituted some years ago a Ministerial, or Departmental Advisory Committee which consists of the Director, with the heads of specialist branches (though some are not invited in to all meetings), the officers-in-charge of the three main Research Stations, the Director of Conservation and Extension, and the Director of Native Agriculture. The procedure for the working of this Committee was significantly altered during the year in the light of past experience. The Advisory Committee, at full strength, will meet every May or June and will review policy, taking into account research findings of previous years and any serious deficiencies in knowledge or approach which have manifested themselves. As a result of the discussions new policy for the Stations, in addition to the long-term trials and experiments previously agreed and already in progress, will be decided. For example a new appraisal of crop ecology, of the suitability of different crops for different soil and climatic conditions, may be considered essential and this will clearly involve all Stations. Others, such as investigations on kenaf or wheat, may involve only a few. But in any event the requirements will be clear to all. Following the policy meeting the essential and experimental requirements, together with any other fresh experiments originating either with the Station Staff or in specialist branches and having passed the scrutiny of the officer-in-charge, will be discussed and finalized down to the last detail with the specialist officers concerned such as Chemistry, Plant Pathology, Pasture Research. In August or September the Advisory Committee meets at each Station with all the appropriate Station staff and the final experimental programme is reviewed. The new procedure proved very successful during the year: the first policy meeting is still to be held. All Stations and branches have been asked for a review of their entire work up to the present day, of their achievements, the state of their present knowledge and what they consider to be their own most urgent research requirements. The farm and district trials of the Department of Conservation and Extension and the station trials of Native Agriculture are very closely interwoven with the research programme both at the meetings already described and subsequently in further departmental committees.

FEDERAL RESEARCH

Closely linked with the Departmental Research Advisory Committee is the Federal Research Advisory Committee which consists of the Director of Research and Specialist Services as Chairman, the Director of Native Agriculture, Southern Rhodesia, the Chief Scientific Officer, Northern Rhodesia and the Chief Scientific Officer, Nyasaland. The objects of the Federal Committee are naturally on a broader scale, to extend agronomic trials over much wider climatic and ecological zones, to make research information freely interchangeable, to make recommendations on such matters as common statistical design and to review research matters at the request of bodies such as the Federal Standing Committee on Agricultural Production, to which recently the Committee reported on the most urgent requirements in fundamental research as a guide for the projected Agricultural Research Council.

FEDERAL AGRICULTURAL REPORT

The report of the Federal Standing Committee on agricultural production was published early in the year, and its main recommendations have been systematically re-examined and reviewed and where necessary re-emphasized at further meetings during the year. The most important of the recommendations, or the most immediate, as far as the Department is concerned, is that dealing with the setting up of an Agricultural Research Council. Discussions on this critical subject have taken place, but at the end of the year under review, although it was known that one was imminent, no enabling Bill had been published.

FERTILIZERS

The control of the composition of fertilizer mixtures rests with the fertilizer companies, Government control being exercised through the appropriate Act governing the registration and sale of fertilizer materials. In practice the fertilizer companies make and sell a standard range of mixtures dependent on agricultural requirements, sales and storage facilities. In the past the mixtures have been decided on by a representative gathering of all the interests concerned under the auspices of the Rhodesia Tobacco Association. During the year the Fertilizer Advisory Committee was constituted as a Ministerial Committee, and its first meeting was held under the chairmanship of the Director of Research and Specialist Services.

BUSH CONTROL

Following a meeting on Weed Control, sponsored by industry, and held at the Victoria Falls, a very representative gathering (representing leading scientists in this field from Britain and Africa) was held in Salisbury, under the chairmanship of the Director of Research and Specialist Services, to consider specifically Arboricides and Bush Control. The great, the very great, importance of arboricides was accepted and repeatedly stressed, as was the need for a co-operative approach between East and Central Africa and the scientists doing fundamental research on the subject at Oxford.

COMMITTEES AND BOARDS

The Director, or his deputy, served on the following Committees and Boards:—

Federal Standing Committee on Agricultural Production;

Federal Research Advisory Committee (Chairman);

Departmental Research Advisory Committee (Chairman);

Tobacco Research Board.

Cabinet Sabi Valley Development Co-ordinating Committee;

Tsetse and Trypanosomiasis Committee;

Fertilizer Advisory Committee (Chairman);

Senior Officers of the Department served on numerous inter-departmental committees.

VISITS OUTSIDE THE FEDERATION

The following officers attended various meetings and conferences or participated in study tours:

Dr. B. E. Ellis attended a meeting of S.A.R.C.C.U.S. in Lourenco Marques.

Dr. B. S. Ellis attended the Joint Meeting of the Councils of Inter-African Pedological Services and the Inter-African Bureau of Soils, at Yangambi, Belgian Congo.

Dr. B. S. Ellis attended the Research Planning Conference of the High Commission Territories at Maguga, Kenya.

Mr. J. G. Thompson visited the United States of America to study methods of Soil Survey, Laboratory Techniques and Land Capability Classification.

Mr. J. A. Whellan attended the Inter-African Phyto-sanitary Committee Meeting of Experts in Nairobi.

Mr. J. A. Whellan attended the Annual Meeting of the Inter-African Phyto-sanitary Commission in London.

Mr. R. G. Jones attended the Dairy Show in England and also visited Holland regarding staff recruitment.

Mr. R. C. Elliott visited the U.S.A. and the U.K. to study modern techniques and to investigate Ruminal Digestion and its Application in Livestock Feeding.

Dr. A. Maar attended a meeting of the International Union for the Conservation of Nature and National Resources held in Athens, Greece; he also made a brief study tour of fisheries' organizations and installations in the Mediterranean.

Mr. J. C. Raath visited the Belgian Congo as a member of the Official Trade Mission.

Dr. W. L. Fielding attended the Second Session of the Inter-African Conference on Industrial, Commercial and Agricultural Education in Angola.

In addition, Mr. J. M. Rattray, Officer-in-Charge Matopos Research Station, devoted his long leave to the completion of his Grassland Map of Africa in Rome. This had been commissioned the previous year by the United Nations Food and Agricultural Organization.

ACKNOWLEDGEMENTS

I would like to express, first of all, my appreciation of the hard work done by Mr. T. K. Sansom, for a period of many months at a time, in assisting me and in acting on behalf of the Director. I would like to extend this appreciation to all the other officers of the Department who have continued to work with the greatest enthusiasm, often on abstruse lines of research almost unknown to the farming community they serve.

I would like to mention the close and friendly co-operation between this Department and the Department of Conservation and Extension in particular and the efforts continuously made to ensure the most harmonious working of research and extension in the cause of agriculture. Co-operation with other Departments and indeed with other Ministries or even Governments is as close and as friendly even though of necessity it is more discontinuous.

The Department faces the future with the greatest confidence in its ability to challenge the problems of agriculture.

ANIMAL PRODUCTION

J. C. RAATH
CHIEF ANIMAL HUSBANDRY OFFICER

The year under review was another successful year for cattle production. Rainfall was adequate and cattle maintained good condition during the dry season.

THE BEEF INDUSTRY

Below are given figures for total cattle numbers in the Federation as well as some details of the European owned cattle population over the past five years.

NUMBERS OF EUROPEAN AND AFRICAN OWNED CATTLE IN THE FEDERATION (IN THOUSANDS)

Year	Federal State		S. Rhodesia		N. Rhodesia		Nyasaland	
	European owned	African owned	E	A	E	A	E	A
1953 . . .	1,337	2,937	1,197	1,832	129	843	11	262
1954 . . .	1,367	2,988	1,227	1,850	130	855	10	283
1955 . . .	1,381	3,069	1,246	1,901	125	871	10	297
1956 . . .	1,493	3,110	1,344	1,910	139	872	10	308
1957 . . .	1,600	3,190	1,434	1,981	155	892	11	317

DETAILS OF EUROPEAN OWNED CATTLE IN SOUTHERN RHODESIA

Year	Total number	Number of cows	Number of calves	Total losses
1953 . . .	1,196,570	411,829	192,778	62,486
1954 . . .	1,227,066	430,071	207,196	57,251
1955 . . .	1,246,254	449,306	206,746	65,043
1956 . . .	1,344,136	485,926	235,071	54,846
1957 . . .	1,434,155	524,304	270,114	57,443

A substantial increase took place in the total cattle population of the Federation during 1957. Details of the European owned cattle in Southern Rhodesia indicate a particularly encouraging increase in the number of breeding cows and calves, while losses remained at a satisfactory low level.

Supplies of Slaughter Cattle. The following figures indicate the total supplies of slaughter cattle from European and Native sources in Southern and Northern Rhodesia but excluding cattle slaughtered for consumption in African reserves.

TOTAL SUPPLIES OF SLAUGHTER CATTLE

Year	Number Slaughtered in Southern Rhodesia	Average C.D.W.	Number Slaughtered in Northern Rhodesia
1953	227,923	423	34,584
1954	256,271	423	24,773
1955	259,666	420	31,262
1956	237,069	424	30,561
1957	264,355	415	51,974

NUMBERS AND GRADES OF CATTLE SLAUGHTERED IN THE CONTROLLED AREAS OF SOUTHERN RHODESIA FOR THE YEAR ENDING 30TH SEPTEMBER, 1958

A. COMBINED TOTALS FOR ALL COLD STORAGE COMMISSION PLANTS

Grade	Oxen	Cows & Heifers	Bulls	Total 1958	Total 1957
Rhodesia Best	2,416	249	—	2,665	2,435
Imperial	8,189	425	—	8,614	7,560
Standard A	37,041	2,139	—	39,180	32,850
G.A.Q.	36,218	20,474	—	56,692	47,614
F.A.Q.	15,535	11,366	—	26,901	21,936
Compounds	13,140	12,706	2,879	28,725	24,741
Inferior	2,403	9,529	307	12,239	7,834
TOTAL	114,942	56,888	3,186	175,016	144,970

B. COMBINED TOTAL FOR PRIVATE BUTCHERS

Grade	Oxen	Cows & Heifers	Bulls	Total 1958	Total 1957
Rhodesia Best	358	68	—	426	383
Imperial	1,779	211	—	1,990	1,788
Standard A	3,722	748	—	4,470	4,618
G.A.Q.	4,593	4,233	—	8,826	8,587
F.A.Q.	2,272	2,423	—	4,695	4,617
Compound	3,525	3,131	719	7,375	6,517
Inferior	261	1,507	11	1,779	2,301
TOTAL	16,510	12,321	730	29,561	28,811

GRADE PERCENTAGES OF CATTLE SLAUGHTERED IN CONTROLLED AREAS

Grade	C.S.C.		Private Butchers		Total Numbers	
	Number	%	Number	%	1958	1957
Rhodesia Best	2,665	1·53	426	1·45	3,091	2,818
Imperial	8,614	4·92	1,990	6·41	10,604	9,348
Standard A	39,180	22·39	4,470	15·71	43,650	37,468
G.A.Q.	56,692	32·39	8,826	29·96	65,518	56,201
F.A.Q.	26,901	15·37	4,695	15·94	31,596	26,553
Compound	28,725	16·41	7,375	25·03	36,100	31,258
Inferior	12,239	6·99	1,779	6·04	14,018	10,135
TOTAL	175,016	—	29,561	—	204,577	173,781

The total number of cattle slaughtered during 1957 was the highest on record. Figures from the controlled areas in Southern Rhodesia indicate that during 1958 a new peak was reached. The Cold Storage Commission increased its turnover in cattle by 30,000 head. The percentages of the different grades remained constant. Total supplies of beef were well maintained throughout the year, but supplies of Top Grade beef varied considerably. The failure to provide regular supplies of high grade beef throughout the year created problems in maintaining consistent consumer interest in better quality beef. No changes were made in grading or retail marketing of beef, although certain recommendations were made for consideration by the different organizations interested in the cattle industry.

The C.S.C. slaughtered 1,029 calves and private butchers 9,463 during the year. Slaughterings of immature male stock (6,547) and suitable breeding stock (2,705) represented a disturbing increase over last year's figures of 1,102 and 1,886 respectively. This can only be the result of a wrong interpretation of what is actually designated as lean beef.

Prices of slaughter cattle. The cost of production index for beef increased by 1.17 per cent. After negotiations with producers it was decided that because of the general economic situation in the country cattle prices should not be increased. The following price schedule was gazetted for the year commencing 1st April, 1958.

MINIMUM PRICES OF BEEF

Period Commencing	Rhodesia's Best per 100 lb.	Imperial per 100 lb.	Std. "A" per 100 lb.	G.A.Q. per 100 lb.	F.A.Q. per 100 lb.	Compound per 100 lb.	Inferior per 100 lb.
1958							
Mar. 1	151s.	100s.	141s.	129s.	115s.	84s.	62s.
3	148s.	99s.	138s.	127s.	113s.	83s.	62s.
10	146s.	97s.	136s.	125s.	111s.	82s.	62s.
17	144s.	96s.	134s.	123s.	109s.	81s.	62s.
24	142s.	95s.	132s.	121s.	107s.	80s.	62s.
31	140s.	94s.	130s.	120s.	105s.	80s.	62s.
April 7	139s.	94s.	129s.	119s.	104s.	80s.	62s.
14	138s.	94s.	128s.	118s.	103s.	80s.	62s.
21	138s.	94s.	128s.	118s.	103s.	80s.	62s.
28	138s.	94s.	128s.	118s.	103s.	80s.	62s.
May 5	138s.	94s.	128s.	118s.	103s.	80s.	62s.
12	138s.	94s.	128s.	118s.	103s.	80s.	62s.
19	138s.	94s.	128s.	118s.	103s.	80s.	62s.
26	138s.	94s.	128s.	118s.	103s.	80s.	62s.
June 2	138s.	94s.	128s.	118s.	103s.	80s.	62s.
9	138s.	94s.	128s.	118s.	103s.	80s.	62s.
16	138s.	94s	128s.	118s.	103s.	80s.	62s.
23	138s.	94s.	128s.	118s.	103s.	80s.	62s.
30	138s.	95s.	128s.	118s.	103s.	80s.	62s.
July 7	139s.	96s.	129s.	119s.	104s.	80s.	62s.
14	141s.	97s.	131s.	121s.	107s.	81s.	62s.
21	143s.	98s.	133s.	123s.	109s.	83s.	62s.
28	147s.	99s.	137s.	127s.	113s.	85s.	62s.
Aug 4	151s.	100s.	141s.	131s.	117s.	87s.	62s.
11	156s.	104s.	145s.	135s.	121s.	89s.	62s.
18	158s.	106s.	147s.	137s.	123s.	90s.	62s.
25	161s.	109s.	150s.	140s.	126s.	91s.	62s.
Sep 1	163s.	111s.	152s.	142s.	128s.	93s.	62s.
8	165s.	114s.	155s.	144s.	130s.	95s.	62s.
15	168s.	116s.	158s.	146s.	132s.	97s.	62s.
22	172s.	119s.	162s.	148s.	134s.	99s.	62s.
29	176s.	121s.	166s.	150s.	136s.	101s.	62s.
Oct 6	178s.	123s.	168s.	154s.	138s.	102s.	62s.
13	180s.	125s.	170s.	156s.	140s.	105s.	62s.
20	182s.	127s.	172s.	158s.	142s.	107s.	62s.
27	184s.	129s.	174s.	160s.	144s.	109s.	62s.
Nov. 3	184s.	129s.	174s.	160s.	144s	109s.	62s.
10	184s.	129s.	174s.	160s.	144s.	109s.	62s.
17	184s.	129s.	174s.	160s.	144s.	109s.	62s.
24	182s.	127s.	172s.	158s.	142s.	107s.	62s.
Dec 1	180s.	124s.	170s.	155s.	140s.	105s.	62s.
8	178s.	122s.	168s.	152s.	138s.	103s.	62s.
15	176s.	120s.	166s.	150s.	136s.	102s.	62s.
22	174s.	118s.	164s.	148s	134s.	101s.	62s.
29	172s.	115s.	162s.	146s.	132s.	99s.	62s.
1959							
Jan 5	170s.	113s.	160s.	144s.	130s.	97s.	62s.
12	166s	110s.	157s.	141s.	127s.	94s.	62s.
19	164s.	108s.	154s.	138s.	124s.	92s.	62s.
26	161s.	105s.	150s.	135s.	121s.	90s.	62s.
Feb 2	158s.	103s.	147s.	132s.	118s.	89s.	62s.
9	157s.	102s.	145s.	131s.	117s.	88s.	62s.
16	154s.	101s.	143s.	130s.	116s.	86s.	62s.
23	151s.	100s.	141s.	129s.	115s.	84s.	62s.

PRODUCTION AND MARKETING

Natural Statistics indicate that a continuous expansion in cattle production has taken place over the past five years and the major objective in beef production policy has now been achieved. The Federation has reached self-sufficiency in beef production on present levels of consumption, as determined by the purchasing power of the population. In future, export markets will have to be developed for a small surplus if present trends of production persist. Prospects in this connection appear to be favourable, in such products as canned beef, frozen boneless beef and small quantities of chilled high quality beef to certain African territories. It is also possible that with greater industrial development and subsequent improvement in purchasing power the demand would again overtake supplies in the near future. The achievement of self-sufficiency can largely be attributed to the confidence created in the industry by a reasonably long-term guaranteed price and a stable market. In addition, favourable seasons and improvements in management as well as increased provision of winter feed have assisted in producing the beef requirements sooner than was generally anticipated. The successful operations of

the Cold Storage Commission under the free marketing system ensured maximum intake of cattle and disposal of beef. Additional markets for beef were provided by the conclusion of contracts with butchers in Northern Rhodesia to obtain supplies of beef cattle from Southern Rhodesia.

During the year a Government Mission visited the Congo to study the possibilities of expanding the beef market in that territory. This visit revealed that the demand for beef was essentially for the lower qualities for African consumption, but that a limited though lucrative demand also existed for our high quality beef, if this could be successfully exploited.

Regulations were published during the year giving powers to inspectors of this Ministry to inspect meat delivered in large contracts to Government and other institutions. It is considered that these inspections will in time materially affect the quality of beef supplied in big contracts and in this way assist in the maintenance of a progressive beef production policy.

The Federal Standing Committee on Agricultural Production in collaboration with Sir Frank Engledow published the Report on Agricultural Policy in the Federation, in which important observations on beef production were made in an attempt to provide guidance on the controversial subject of beef production policy. The document supported several important contentions held by this Ministry for many years. It indicated that the demand for low grade beef was in the long term detrimental to the development of a progressive beef production policy. It recognized that the production of low grade beef can only be achieved under conditions of poor management and overstocking, leading to ultimate destruction of the land and lower production. It supported the contention that increased supplies can only be achieved if quality and youth were encouraged at the same time. Agreement was expressed with the Government policy of long term price guarantees and market stability. The modern demand for younger and leaner beef was emphasized and changes were recommended in the grading system to cater for these requirements. These recommendations were extensively discussed by all organizations connected with the cattle industry and a specific system of grading is expected to be finalized early next year.

In addition it recommended intensive research on cheaper methods of feeding as well as into the causes of the low reproduction rate. Experiments of this nature have been successfully undertaken by this Ministry and given wide publicity. The recommendations have been applied in practice by many producers with excellent results.

PIGS

Pig production has for several years varied from a marked decline to a small increase. Reliable estimates of production trends have been difficult because returns by producers are incomplete. Since 1957 an attempt has been made to rectify the position by more detailed quarterly returns. The position has since improved, but as a result of the quick changes that can take place in pig production the present returns are still not entirely satisfactory. Breeding stock showed a substantial increase during 1957, but quarterly returns indicate a reversal of this trend during the first half of 1958.

NUMBERS OF EUROPEAN OWNED PIGS
IN SOUTHERN AND NORTHERN RHODESIA

Year	*Southern Rhodesia*	*Northern Rhodesia*
1953	74,113	9,000
1954	64,090	7,000
1955	53,187	10,000
1956	50,195	13,000
1957	54,230	18,000

TOTAL NUMBER OF PIGS SLAUGHTERED

Year	*Southern Rhodesia*	*Northern Rhodesia*
1954	121,212	10,123
1955	102,260	12,697
1956	92,438	15,185
1957	94,332	16,000

PIGS SLAUGHTERED AND GRADED IN THE CONTROLLED AREAS OF SOUTHERN RHODESIA

A. Combined Totals for Colcom Products

Grade	Baconers		Porkers		Cutters	
	Number	%	Number	%	Number	%
A	38,416	78·15	12,327	59·83	2,928	38·90
B	4,588	9·33	3,449	16·74	1,392	18·48
C	1,807	3·68	—	—	—	—
L	1,533	3·12	182	0·88	56	0·77
X	2,728	5·55	4,356	21·14	3,039	40·36
Inferior	80	0·17	291	1·41	112	1·49
Total	49,152	—	20,605	—	7,528	—

Grade	Underweight Pigs		Overweight Baconers		Manufacturing Pigs		Boars	
	No.	%	No.	%	No.	%	No.	%
A	—	—	—	—	234	85·54	262	89·42
B	382	27·03	499	98·42	455	12·03	—	—
C	—	—	8	1·58	—	—	—	—
L	24	1·70	—	—	—	—	—	—
X	677	47·92	—	—	—	—	—	—
Inferior	330	23·35	—	—	92	2·43	31	10·58
Total	1,413	—	507	—	3,781	—	293	—

B. Combined Totals for Private Butchers

Grade	Porkers		Cutters		Underweight pigs	
	No.	%	No.	%	No.	%
A	4,265	24·86	214	3·15	—	—
B	1,262	7·35	155	2·28	573	15·62
L	31	0·18	—	—	51	1·39
X	10,006	58·33	3,996	58·88	2,220	60·51
Inferior	1,588	9·28	2,423	35·69	825	22·48
Total	17,152	—	6,788	—	3,669	—

During 1958 Colcom Products slaughtered a total of 83,237 pigs compared with 63,424 during the previous year, while numbers for private butchers increased from 24,798 to 27,609. The substantial increase followed on the increase of breeding stock in 1957, and was certainly assisted by the reduced incidence of agalactia with a corresponding decrease in the heavy piglet mortality caused by the condition. As a result of experiments carried out by the Veterinary Department ergotized munga has clearly been established as a cause of non-febrile agalactia. During the year producers in Northern Rhodesia had difficulty in disposing of their pigs and Colcom Products made arrangements to accept these in order to assist them. These producers have since formed their own Co-operative to manage their affairs.

Certain changes were made in the grading system following on representations by producers, Colcom Products, and the Pig Industry Board. The heavy cutter grade was converted into a lightweight bacon grade. The two lighter cutter grades were combined into one grade, and the maximum weight for the bacon class was reduced from 180 lb. c.d.w. to 175 lb. c.d.w.

The following grading and price schedule came into operation on 1st August, 1958.

MINIMUM AND MAXIMUM PRICES FOR PIG CARCASES

Item	*Minimum Price Per lb. c.d.w.* s. d.	*Maximum Price per lb. c.d.w.* s. d.
1. Underweight Pig, under 55 lb. c.d.w.—		
Grade B	1 7	1 10
Grade L	1 2	1 5
Grade X	10	1 1
Inferior	4	6
2. Porker, 55–100 lb. c.d.w.—		
Grade A	1 8½	1 11½
Grade B	1 7	1 10
Grade L	1 2	1 5
Grade X	10	1 1
Inferior	4	6

MINIMUM AND MAXIMUM PRICES FOR PIG CARCASES

Item	Minimum Price Per lb. c.d.w. s. d.	Maximum Price per lb. c.d.w. s. d.
3. Cutter, 101–123 lb. c.d.w.—		
Grade A	1 5½	1 9
Grade B	1 4	1 7
Grade L	1 0½	1 3½
Grade X	10	1 1
Inferior	4	6
4. Lightweight Baconer, 124–134 lb. c.d.w.—		
Grade A	1 9	2 0
Grade B	1 6	1 9
Grade C	1 1	1 4
Grade L	1 2	1 5
Grade X	10	1 1
Inferior	4	6
5. Baconer, 135–175 lb. c.d.w.—		
Grade A	1 10½	2 1½
Grade B	1 6½	1 9½
Grade C	1 3	1 6
Grade L	1 5	1 8
Grade X	10½	1 1½
Inferior	4	6
6. Overweight Pigs (Good) 176–190 lb. c.d.w.	1 4	1 7
7. Manufacturing Pigs. 176 lb. c.d.w. and over		
(*a*) Sows and others:		
Grade A	11½	1 2½
Grade B	9	1 0
Inferior	4	6
(*b*) Boars:		
Grade A	6	9
Grade B	4	6

Seedy Cut.—In respect of all carcases, graded as Underweight, B and L; Porkers A, B and L; Cutters, A, B and L; Lightweight Baconers, A, B, C and L; Baconers A, B, C and L, and Overweight Pigs (Good) which contain seedy cut to the extent of reducing the value of the carcase, the amount of minimum and maximum prices shall be reduced by 1d. per lb c.d.w.

PROGENY TESTING

The application of the progeny test is universally recognized as being genetically the soundest method for the determination of breeding values. Most progressive countries have organized pig progeny testing schemes. For the first time facilities of a similar nature are made available to Rhodesian producers, which will enable them to make the fullest use of the sound basis offered by this scheme for the selection of their breeding pigs. A full report of all pigs tested has been published. A condensed table of the major results is given below.

AVERAGE PERFORMANCE FIGURES OF ALL PIGS TESTED

Breed	Age at slaughter	Feed conversion lb. feed/ lb. gain	Length	Backfat Thickness in min. and grade		% of cuts			
				Shoulder	Middle	Rump	Shoulder	Middle	Ham
Swedish Landrace	201·0	3·49	828·2	39·8A	22·4A	25·5A	26·9	49·0	24·1
Large White	199·7	3·44	809·4	43·0A	21·9A	27·1A	28·5	47·7	23·8

These results compare favourably with those obtained in the other countries and indicate that Rhodesian pigs are of a high standard.

SHEEP

Sheep production increased steadily over the past few years. Interest in sheep production became so active that a Sheep Breeders' Association was formed with the specific object of encouraging mutton production and to promote the interest of sheep breeders. A few outstanding consignments of sheep were imported. Special farmers' days and demonstrations were held to discuss problems in production.

GENERAL

Close co-operation was maintained with the Extension Services. The special Animal Husbandry officers have given assistance to the advisory services on an extensive scale. Several special animal husbandry courses were organized for field officers as well as farmers.

BRANCH OF BOTANY, PLANT PATHOLOGY AND SEED TESTING

DR. G. R. BATES
CHIEF BOTANIST AND PLANT PATHOLOGIST

INTRODUCTION

The organization of the Branch was unchanged during the period under review and the three sections continued to undertake *ad hoc* investigations in addition to their usual specialized advisory services. Restrictions on expenditure led to the curtailment of some activities whilst travelling had to be allocated on a priority basis.

The professional establishment was augmented by the appointment of Mr. K. B. Hanssen as Crop Inspector to the Seed Section in October, 1957. Dr. H. Wild continued his secondment to the Flora Zambesiaca project in London.

Considerable progress was made in the production of high quality seed crops, especially of certain vegetables. Farmers throughout the Federation are being attracted by the possibilities of this new industry and requests for information and advice on the subject have been almost overwhelming. Production has expanded so rapidly that despite the appointment of a full-time inspector it is already difficult to satisfy the demands for inspection and advisory services with the existing staff. Another important development was the formation of a Tobacco Seed Association which, it is expected, will be in a position to produce certified tobacco seed during the 1958-59 season.

It is embarrassing to have to refer again to the unsatisfactory accommodation provided for the Botany and Plant Pathology sections but the situation is now so serious that it is definitely affecting the efficiency of these sections. Congestion in the Herbarium has reached saturation point and, unless more space is obtained, it will be impossible to house any new specimens. Further additions are also needed to the Seed Testing Laboratory to cope with the vastly increased volume of samples submitted for analysis.

The plant pathology programme was extended to cover disease problems of wheat, kenaf and castor bean in addition to work already in progress on maize, potato and legumes. Attention was again given to several important diseases affecting fruit and vegetable crops. It was also possible to undertake more botanical fieldwork than in the past. In all these activities we have, as usual, enjoyed the valued assistance and co-operation of other Branches and Research Stations and of the Department of Conservation and Extension.

Exhibits were staged at the Bulawayo, Gwelo and Salisbury Agricultural Shows and at the annual Horticultural Trade Show in Salisbury. Lectures on plant pathology and seed testing were delivered to students at the Gwebi College of Agriculture. Numerous Farmers' Associations and other bodies concerned with agriculture and horticulture were addressed by various officers from the Branch.

One paper was published in the "Rhodesia Agricultural Journal" and three in overseas scientific journals. Articles, notes, and reviews were contributed regularly to the "Rhodesian Farmer" and to the daily Press.

BOTANY

Herbarium. Some 900 more plants were named for Government Departments, other official institutions and the general public than in the previous year. The total number of accessions at 8,033 was nearly 2,000 less than the previous record intake but this decline was entirely accounted for by a reduction in the volume of named duplicates received from other herbaria. More than 88,600 specimens are now contained in the Herbarium, which represents an increase of ten per cent. during the period under review. The two Northern Territories made increased use of our facilities and sent in three times as many specimens as in any previous year. Large collections were also received from Government Departments in Bechuanaland.

Noteworthy collections which included many valuable records of new or rare species were supplied by Mr. L. D. E. F. Vesey-FitzGerald and Mr. E. A. Robinson from Northern Rhodesia, Mr. J. D. Chapman from the Mlanje district and by Mr. J. S. de Beer from Bechuanaland. Mr. N. C. Chase continued to provide

excellent material from the Eastern Districts whilst Major O. B. Miller was, as usual, the most prolific collector in Matabeleland. A fine collection of ferns from the Chimanimani Mountain was received from Mr. D. S. Mitchell of the University of Cape Town. Many other collectors, too numerous to list by name, also sent in valuable material.

Nine thousand, one hundred and ten duplicates were exchanged with herbaria in many parts of the world. Material of selected genera of families was dispatched on loan to specialists whilst regular collections were forwarded to Kew, the British Museum and other herbaria for use in the preparation of the Flora Zambesiaca.

One thousand two hundred and ninety-four numbers were collected by the staff in the course of field expeditions to the Urungwe, Sebungwe, Inyanga, Melsetter, Chirundu and Darwin areas. Members of the botanical staff also accompanied expeditions organized by the Rhodesian Schools Exploration Society to the Mateke Hills and lower Mazoe.

Steady progress was made on the Flora Zambesiaca, the typescript of Volume 1, Part 1, being completed in August. Publication of this Part is expected during January, 1959. It will contain about 250 pages with 75 line drawings and a coloured frontispiece and includes descriptions of 25 families and of the genera and species together with appropriate keys. Work on Volume 1, Part 2 is also well advanced and it should be ready for publication by August, 1959. Dr. E. Launert joined the staff of the Flora during the year and is specializing on the *Gramineae*. He is also assisting in the preparation of families included in Volume 2. Another member of the London staff working on the Flora, Dr. N. B. K. Robson, arrived in the Federation at the beginning of September, 1958, to spend six months collecting in the north-eastern district of Northern Rhodesia and in Central Nyasaland. Both these regions are not well known botanically.

Numerous visitors were welcomed to the Herbarium to discuss botanical problems and to work on our collections. We were honoured by an informal visit by H.E. the Governor-General in January. Although not in good health, Mr. F. C. Greatrex again gave valued assistance by naming all the orchid material received.

Economic Botany. Many cases of suspected plant poisoning in animals and humans were investigated on behalf of the Government Analyst, the Veterinary Department and medical officers.

Sarcostemma viminale and *Cestrum aurantiacum* were implicated with the death of cattle at Enkeldoorn and Penhalonga respectively. *Dietes prolongata* was identified as a possible agent in the fatal poisoning of cows at Chipinga. *Burkea africana, Dicerocaryum zauquebarium, Phytolacca dodecandra,* and *Lasiosiphon kraussianus* were named in human poisoning fatalities.

Information on the poisonous properties of various wild and cultivated plants and their seeds was supplied to medical practitioners. Enquiries continued to be received from pharmaceutical firms and individuals regarding the availability and cultivation of plants possessing intrinsic medicinal qualities. Many of these enquiries referred to *Dioscorea sylvatica.* Plants used as food and medicine by the Tonga in the region shortly to be inundated by the Kariba Lake were identified for the Rhodes-Livingstone Museum. Fruit and leaves of many native food plants were named for Mr. Carr of the Nutrition Unit.

Legumes were identified for the Grassland Research Station in connection with *Rhizobia* investigations. Many enquiries regarding the agronomic value of indigenous and exotic legumes and grasses were dealt with from farmers and officers from other Departments. Further assistance was given to the Government Helminthologist by naming host plants of nematodes and to Entomologists studying aphids.

Dr. G. R. Bates and Mr. J. B. Phipps represented the Branch at the African Weed Control Conference held at the Victoria Falls Hotel in July, 1958. A paper was presented on "Water Hyacinth and its Control in Southern Rhodesia". The conference was well attended by delegates drawn from many African territories and also from overseas. The proceedings served to emphasize the magnitude of crop losses due to weed competition and to the value of new chemical herbicides for dealing with the problem. Current investigations on chemical weed control in the Federation are somewhat haphazard and a clear need exists to co-ordinate them and to extend both research and advisory services in this important field.

No fresh outbreaks of water hyacinth were recorded. All known infestations were inspected and, where necessary, sprayed with 2, 4-D. Special attention

was given to the largest infestation in Lake McIlwaine and the nearby Hunyani and Makabusi rivers.

Encroachment by *Lantana camara* on farm lands is already a serious problem in parts of the Federation and renewed representations have been made for it to be declared a noxious weed in Southern Rhodesia. Until more is known about the economic control of *Lantana* either by mechanical or chemical methods or by a combination of both it is felt that it would be premature to prescribe it as a noxious weed. *Lantana* is also a problem in Northern Rhodesia where a variant has recently been discovered which is distinguishable from ordinary *Lantana* by its soft pubescence.

PLANT PATHOLOGY

Advisory. The general pattern of crop diseases was noticeably related to weather conditions during the summer season. November and December were unusually hot and dry whereas the following two months were exceptionally wet. Nearly one-third of the 576 specimens dealt with in the course of the year were received in January and February. The moist humid conditions prevailing during this period were associated with the prevalence of many agarics, numerous specimens of which were sent in for identification and advice regarding their suitability for eating.

Thirty new host and disease records were obtained of which the following deserve special mentions:—

Late blight of eggplant *(Solanum melongena)* due to *Phytophthora infestans* (Mont.) de Bary; mildew and wilt of tomato due respectively to *Leveillula taurica* (Lev.) Ar. and *Fusarium bulbigenum* v. *lycopersici* (Brushi) Wollenw. and Reinking; leaf blotch of castor bean due to *Phyllosticta ricini* Rost; anthracnose of lucerne due to *Colletotrichum trifolii* Bain and Ess.; anthracnose of kenaf *(Hibiscus cannabinus)* due to *Glomerella cingulata* (Stonem.) Sp. and v. Schr. (conidial stage); leaf spot of star grass *(Cynodon plectostachya)* due to *Piricularia grisea* (Cooke) Sacc.; leaf spot of sorghum due to *Colletotrichum graminicolum* (Ces.) Wils.; fruit rot of *Citropsis daweana* due to *Glomerella cingulata* (Stonem.) Sp. and v. Schr. (conidial stage), and maize streak virus attacking *Eleusine indica.*

Tobacco. Weather conditions made it a difficult season for tobacco. Hot, dry weather during the early weeks of the season was associated with the frequent development of sore-shin *(Rhizoctonia solani)* in transplanted seedlings. Leaf scorch was also prevalent during this period. White mould was widely reported and caused serious losses in many cases. Wildfire and angular spot were common, the latter being particularly troublesome later in the season. Angular spot was also found in seedbeds in September, 1958 this being several weeks earlier than any previous record over the past thirty years.

Anthracnose *(Colletotrichum tabacum)* was the dominating tobacco disease for the second successive season being widespread in seedbeds of both Virginia and Turkish varieties. Crops in the field were also attacked during the wet spell in January-February. The first case of tobacco anthracnose on Virginia type seedlings in Nyasaland was recorded in October, 1957 and confirmed by this laboratory. Circumstantial evidence pointed strongly to seed imported from Southern Rhodesia being responsible. Investigations by our Seed Testing Laboratory demonstrated that the seed used in Nyasaland did carry *C. tabacum* despite the fact it had been properly treated with 1:1,000 silver nitrate. Another outbreak of the disease in Tanganyika occurred a few weeks later and was traced to the same source of seed as used in Nyasaland. This confirmation of the seed-borne nature of *C. tabacum* is of considerable practical importance. It has emphasized the need to produce guaranteed disease-free seed both for local use and for export. Early steps were therefore taken to achieve this end and it is gratifying to report that a Rhodesia Tobacco Seed Association has now been formed with the object of producing certified seed, free from disease.

The incidence of other common tobacco diseases such as frog-eye, *Alternaria* spot, mosaic and rosette was much the same as in recent years. Three instances of bacterial (Granville) wilt were reported. The leaf blemish known as "tarantaal" or "guinea fowl speckle" in South Africa was much more in evidence amongst leaf offerings on the auction floors than in previous years.

Potato. Late blight was first noticed on December 28th in the Salisbury district but appeared two or three weeks earlier in the Eastern Districts. An outbreak in an isolated planting at Felixburg was traced to the use of imported seed. The disease caused losses in both summer and first irrigation crops although

these were mitigated by the increased planting of field resistant varieties. Early blight *(Alternaria solani)* was more prevalent than for several years past in the summer crop. Blackleg *(Erwinia atroseptica)* occurred extensively in first irrigation crops grown from overseas seed. Several cases of common scab were reported, mainly in irrigated crops.

Maize. Apart from localized outbreaks amongst late planted maize in Matabeleland no untoward development of *Helminthosporium* leaf blight occurred in the principal maize growing districts. No tropical rust *(Puccinia polysora)* was reported or observed.

Maize streak virus was found to be more widely distributed than anticipated in high veld crops. Although the incidence appears to be extremely low its general distribution is of considerable importance since, should circumstances arise to favour its spread, the disease could well be of serious consequence. An example of the potential hazard was recently seen where 15 acres of early planted maize grown under irrigation for the "green mealie" market was almost wiped out by maize streak virus. The disease also caused heavy losses to early maize on farms in and around the Umgusa Irrigation Settlement near Bulawayo. In this case a plentiful reservoir of infection had been built up over a considerable period by a rotation which included a sequence of susceptible crops.

Characteristic leaf markings consisting of chlorotic lesions arranged in ring pattern often associated with a more general speckling were frequently observed on hybrid and double hybrid maize during the 1957-58 season. Such symptoms were particularly common on the lower leaves of the single hybrid N 3-2-3-3. A similar condition known as "leopard spot" has been noted in Kenya. The local disorder closely resembles a maize disease recently reported from West Africa where it is ascribed to a virus. Attempts to transmit the local disease using the maize aphid as a vector have so far been unsuccessful.

The leaf spot caused by *Diplodia macrospora* was again identified on specimens from the Mazoe Valley. Downy mildew (*Sclerospora sorghi*) attacked irrigated maize at Umvumvumu.

Castor Bean. Farmers showed more caution in trying out this new crop than in the previous year. A wider range of varieties was also grown, both commercially and experimentally. In a general survey of such plantings leaf diseases caused by *Alternaria ricini* and *Xanthomonas ricinicola* were found to be wide spread but were not causing serious damage. On the other hand, grey mould *(Botrytis cinerea)* was commonly found attacking the fruiting heads, especially of varieties with spiny capsules, in areas of higher rainfall. It was also recorded on the fruiting heads of wild castor bean plants. Under conditions favouring luxuriant vegetative growth in commercial crops, grey mould also attacked the foliage. Laboratory studies showed that *Alternaria ricini* was commonly seed-borne and could not be completely controlled by fungicidal seed-dressings. It killed off many seedlings in germination tests and could equally well cause similar losses in commercial plantings.

Young castor bean plantings at Gwebi were damaged by *Phytophthora parasitica.* An aereolate type of leaf spot caused by *Phyllosticta ricini* developed in several experimental plots.

Kenaf (Hibiscus cannabinus). Renewed interest has been aroused in the possibilities of kenaf as a fibre crop. Imported seed was used to plant substantial acreages in several parts of the country. Serious damage to such crops in the localized region of the Burma Valley was caused by the disease known as anthracnose tip blight. Marked varietal differences in susceptibility to the disease were observed. In most other kenaf crops, however, the only disease of any consequence was stem-break due to grey mould *(Botrytis cinerea).*

Forage and Green Manure Crops. Legume diseases were not so much in evidence as in recent years, and very few instances of disease in sunnhemp were reported. The cowpea leaf spot due to *Ascochyta phaseolorum* was again widespread and caused serious defoliation of crops in several districts. Root and vine rot (*phytophthora dreschleri*) of velvet bean appeared on farms in the Umtali area.

Leaf spotting diseases and rust caused defoliation in lucerne whilst low veld crops of this important legume were frequently affected by black stem *(Ascochyta imperfecta).*

The first disease to be noted on white clover in Rhodesia was a leaf spot, the symptoms of which resemble those ascribed to the fungus *Pseudoplea trifolii.*

Vegetables. Late blight appeared on tomatoes in the Salisbury district by mid-January and thereafter with the onset of warm, humid conditions, developed rapidly, attaining epidemic proportions during the following month. The disease continued to be reported on outdoor plantings of this host until the end of July. Bacterial wilt and bacterial spot *(Xanthomonas vesicatoria)* together with the virus disorders bunchy top and mosaic troubled commercial growers in the Eastern Districts. Leaf mould caused losses amongst glasshouse crops in Salisbury and also attacked winter plantings in the low veld. *Verticillium* wilt reappeared amongst greenhouse tomatoes some time after the soil medium had been drenched with formalin.

Two new tomato diseases were recorded; wilt due to *Fusarium bulbigenum* var. *lycopersici* and mildew due to *Leveillula taurica.*

Outbreaks of black rot developed in both summer and irrigated Brassica crops. Carrots on light sandy soil were severely attacked by *Sclerotium rolfsii.* Several onion diseases were prevalent including downy mildew, a bulb rot associated with infection by *Fusarium* sp., and smudge due to *Colletotrichum circinans. Stemphyllium botryosum* was recorded for the first time causing damping-off of onion seedlings.

Late plantings of reputedly rust resistant varieties of runner beans were commonly attacked by *Uromyces appendiculatus.*

Fusarium wilt, downy mildew and pod mould attacked commercial crops of field peas in the Eastern Districts whilst scab anthracnose was serious on French beans grown for canning in the same region, Burpees Stringless and Topcrop varieties being very susceptible to the disease.

Flowers. More than 25,000 dahlias were inspected in terms of the Kromnek Regulations. No infection was detected in recent importations but two diseased plants were discovered amongst dahlias from previous introductions. Seven infected plants were also found amongst old-established stocks, the origin of which could not be accurately determined.

RESEARCH

Maize. For the second successive year seasonal conditions were unfavourable for the development of leaf blight due to *Helminthosporium turcicum* and no clear-cut results were obtained from the yield loss experiment at the Salisbury Experiment Station or from the field trials at Gatooma designed to examine the effect of stubble mulching and thrashing upon the onset and intensity of the disease.

Maize streak virus was discovered on both maize and wheat at the Salisbury Experiment Station and crop surveys revealed that it also occurred in the important maize growing districts of Mashonaland. The incidence of infection appeared to be low but these observations suggest that the geographical range of the disease in Southern Rhodesia is considerably wider than previously supposed. A characteristic type of zonate leaf spot usually accompanied by chlorotic speckling was found in several localities on commercial hybrid varieties. The symptoms closely resembled those of a leaf disorder of maize recently reported from West Africa where it has been ascribed to a virus infection. Attempts to transmit the condition by sap inoculation and also by the maize aphid *Rhopalosiphon maidis* met with no success.

Wheat. Work on the identification of the local races of wheat stem rust *(Puccinia graminis tritici)* was handicapped by the unsatisfactory facilities available for testing. However, 26 stem rust collections from various crops in different parts of the country were tested on the standard differentials during the year. A biotype of race 21 occurred on summer wheat in the Salisbury area and was also identified from the 1958 winter crop at Salisbury and Sinoia. On the other hand, stem rust material from the 1957 winter crop in Salisbury keyed out to race 34. Specimens from the same winter crop grown at the Sabi Station were tentatively identified as race 17. Attempts were made to obtain useful mutations for the breeding programme by subjecting small lots of wheat seed to a range of X-ray dosages. Only seed treated with the highest X-ray dosage given (27,500r) was retained for growth studies.

Potato. The programme initiated by this Branch of advancing the planting date of summer crop potatoes to overcome the late blight hazard was transferred to the care of the Potato Breeder. In further spray trials with summer crops no improvement in the control of late blight was obtained by adding a proprietary sticker to mixtures containing 0.2 per cent. Zineb and 0.3 per cent. copper

oxychloride. With both fungicides, however, better control of the disease was obtained when both leaf surfaces were sprayed.

Serological tests were conducted on the potato varieties grown at the Salisbury Experiment Station and brought to light several apparently symptomless carriers of virus X. The masking of virus X in certain varieties under local conditions makes field inspection difficult and it is therefore planned to screen the stock seed used by means of serological tests.

Studies were continued on the overwintering of the bacterial wilt organism, *Pseudomonas solanacearum*, and its possible establishment in heavy soils following the planting of infected potato tubers. Confirmation was obtained that the disease can in fact be disseminated in this manner and that the survival of the pathogen from one rainy season to the next is enhanced by irrigation.

Legumes. Investigations on diseases of French beans demonstrated that scab due to *Elsinoë phaseoli* f.sp. *vulgare* can be seed-borne. The fungus can be carried within the seed coat as well as on the surface. It may also be carried by infected pod trash mixed with the seed. Ten varieties of French beans were tested for their susceptibility to scab and anthracnose *(Colletotrichum lindemuthianum).* The varieties Wade and Selection 6-34-9 proved completely resistant to both diseases. Burpees Stringless was highly susceptible to both scab and all three isolates of the anthracnose fungus used. Another popular variety, Topcrop, was resistant to the anthracnose isolates but proved very susceptible to scab. In continued fungicide trials, Maneb, Captan and Thiram all applied at 2 lb./100 galls. when pod set reached 50 per cent. gave better control of scab on the pods than either Zineb or copper oxychloride. Against anthracnose, however, Maneb and Zineb gave by far the best results. Maneb is therefore to be recommended where both diseases are liable to develop.

Three applications of dusting sulphur gave good control of leaf spot due to *Cercospora arachidicola* on Virginia Bunch and Valencia type groundnuts, the yield of both varieties being increased by 12 per cent.

Deciduous Fruit. Protective sprays of 4:6:50 Bordeaux Mixture reduced the incidence of bitter rot in apples from 18.3 per cent. in the controls to 0.7 per cent., but caused considerable injury to the fruit and foliage, most of which developed early in the season. Although Ferbam and Maneb were less effective in preventing infection, they caused no phytotoxicity. Further spray trials are therefore contemplated using Maneb for the early applications and changing to Bordeaux Mixture later in the season when the copper spray is likely to be less injurious.

Tomato. As in previous seasons 0.2 per cent. Maneb gave the best control of late blight on tomatoes and the highest yield of clean fruit. Good control of the disease was also obtained with a mixture of 0.1 per cent. Zineb and 0.1 per cent. Captan, the mixture being superior to either of these fungicides applied alone at 0.2 per cent.

SEED TESTING

The quite remarkable progress made in the production of many pasture and vegetable seeds during the year under review can, to an appreciable degree, be ascribed to the keenness and enthusiasm of the staff of the Seed Testing Laboratory. Not only have they worked long hours to cope with the greatly increased number of routine tests, but they have also willingly dealt with the continuous demands for advisory and inspection services. As a matter of interest more than 350 people called at the Laboratory in the course of the year mainly for information and advice on seed production of one kind or another.

Laboratory. The number of samples received for testing rose from 1,520 to 2,047, an increase of 35 per cent. Only 2.3 per cent. of the samples failed to satisfy the prescribed minimum standards which is a considerable improvement on previous years. Two thousand, seven hundred and thirty-seven germination tests were made in addition to numerous tests for disease, hard seed content and the presence of weed contaminants. Thirty-one applications for phytosanitary certificates were received in respect of seed intended for export, four of these were rejected.

As usual maize again predominated amongst the samples submitted for testing; grasses, legumes, other cereals and vegetables were also well represented followed by tobacco and flowers.

The seasonal average percentage germination of certified maize at 98.5 was slightly better than the previous year, whilst uncertified seed improved considerably,

the figure being 98.1. Certified seed showed considerably more infection by *Diplodia zeae* than in 1956-57, although uncertified seed improved in this respect. For the second successive year *Colletotrichum graminicolum* was prevalent in certified hybrid seed whereas seed of open pollinated varieties was conspicuously free from such infection.

Assistance was again given to the Grain Marketing Board by grading maize grain for export and in examining the grading standards of locally produced crops. Altogether, 266 maize samples and 110 samples of small grains, chiefly rapoko, munga and sorghum were examined for grading purposes during the year.

At least 60 per cent. of the commercial samples of castor bean seed examined were infected with the fungus *Alternaria ricini* which attacks the leaves and fruiting heads of growing plants in the field. The fungus was found to occur both externally and internally in the seed samples inspected. Fungicidal seed dressings reduced but did not entirely eliminate the infection.

The quality of locally produced kenaf *(Hibiscus cannabinus)* seed submitted for testing proved extremely variable with germination percentages ranging from eight to 92. Only one-quarter of the samples exceeded 75 per cent. germination.

Legislation. Routine inspections were made of seed stocks offered for sale and, with one exception, the samples drawn proved satisfactory. Provisional new grading regulations were drawn up for the Grain Marketing Board for maize, other cereals and groundnuts. In the case of maize fresh criteria have been introduced covering such matters as chipped grain, insect damaged grain and bushel weight. A third grade has also been added. Because of the far reaching implications of these new standards their introduction has been postponed until the 1958-59 season. Meanwhile instruction on grading methods and the application of the regulations was given to the field staff of the Board at a series of courses organized for the purpose.

The discovery of the seed-borne nature of tobacco anthracnose was largely instrumental for the establishment of a Rhodesia Tobacco Seed Growers' Association during the year. The constitution, rules and regulations for the new Association were drawn up by the staffs of the Seed Testing section and the Tobacco Research Board.

SEED PRODUCTION

The staff of the Branch have, during the past twelve months, undertaken practically all the field inspections of pasture grass, vegetable and flower seed and potato crops registered under the certification schemes of the three Associations concerned. These activities will shortly be supplemented by inspections of tobacco seedbeds and crops registered for the production of certified tobacco seed.

1. Grasses. During 1957-58, 2,304 acres were registered for the production of certified grass seed and 1,403 acres were actually inspected as compared with 477 acres in the previous season. Adverse weather conditions were largely responsible for the reduced acreage inspected and also accounted for the indifferent yields. Despite these set-backs the total production of certified grass seed increased by more than 50 per cent. to 80,000 lb. The bulk of the crop consisted of Katambora Rhodes together with substantial amounts of the Ermelo strain of Weeping Love grass and Giant Rhodes. Grass seed production is now more than sufficient to meet local requirements and attention is being directed to the possibilities of the export market. The general quality of the grass seed produced was satisfactory whilst the weed seed content was noticeably lower following the use of improved cleaning techniques. Better seed yields were obtained from the Ermelo strain of Weeping Love grass grown under irrigation than from plantings grown under summer rainfall conditions. A variety of *Panicum maximum* known as Sabi Panicum was registered by the Rhodesia Pasture Seed Growers' Association and breeder seed distributed to growers. Difficulties are likely to be encountered in harvesting this new variety and investigations on this problem are in progress. It was also found that the moisture content of Katambora Rhodes grass seed and seed of other chaffy grasses reacts quickly to changes in atmospheric humidity. Based on the experience gained during the past few years certain changes in the grass seed certification scheme have been proposed.

2. Vegetable and Flower Seed. Rapid progress was made in the production of vegetable seeds under the aegis of the Rhodesia Flower and Vegetable Seed Growers' Association, now in its second year of existence. Four hundred and seventy-six acres were registered for seed production compared with only 108 acres in 1956-57. Peas, bush and pole beans were the most favoured crops but

many other vegetables were grown on a smaller scale either on direct contract or on a trial basis. This new industry has gone ahead so rapidly as to outstrip our knowledge of the seed cropping behaviour of many vegetables and flowers under local conditions. Investigations into the factors influencing seed production in such crops are urgently needed if the industry is to develop on sound lines.

3. Potatoes. Five hundred and eighty-three acres of potato crops grown for seed were inspected for certification, six were rejected and four others downgraded. The total quantity of seed potatoes certified under the present scheme was 37,000 pockets of 75 lb. weight. Some twenty different varieties were encountered in these inspections although Up-to-date and Pimpernel accounted for 63 per cent. of the acreage planted.

Research. The studies on the seed-borne transmission of tobacco anthracnose *(Colletotrichum tabacum)* referred to earlier in this report were made in the Seed Testing Laboratory. Work is being continued on the problem by examining the effect of higher concentrations of silver nitrate on infected Virginia type tobacco seed.

Viability tests on coffee seed stored in Nyasaland were undertaken at the request of the Nyasaland Department of Agriculture. The seed remained dormant for about six weeks after harvesting, germination then improved rapidly remaining at a high figure for four months after which it quickly declined and was completely inviable nine months after harvest.

Examination of grain samples from the Federal Maize Trial showed that plant population and nitrogenous fertilizer treatment influence the quality of the grain produced, high populations and low nitrogen giving the poorest quality. Results from the stubble mulch trial at Gatooma tended to confirm previous findings in that cob infection by *Diplodia zeae* was accentuated by stubble mulching but decreased with increasing levels of nitrogen. Infection by *Fusarium moniliforme* on the other hand was again closely linked with stalk borer damage which tended to increase in the trashed and mulched plots and in plots receiving high rates of nitrogen.

Assessments were again made of the reaction shown by a range of maize hybrids and inbreds to infection by ear rotting pathogens using a refined inoculation technique. Results in general followed the same pattern obtained in previous years. The recently released double hybrid 52 DH 22 proved fairly resistant to both *Diplodia zeae* and *Fusarium graminearum.*

Seed dressing trials were conducted with various grain crops. In the case of maize using several combined fungicide-insecticide dressings the emergence of chipped grain was improved by such treatments. Organic mercurial preparations were less effective than formulations based on T.M.T.D. (Thiram) in controlling smut on sorghum seed. A similar range of fungicidal dressings was tested on wheat infected with black point disease *(Helminthosporium sativum).* Both the mercurial and Thiram based preparations reduced the degree of infection but none gave complete control of black point.

Considerable assistance was given to the Veterinary Research Laboratory regarding investigations into the condition known as afebrile agalactia in pigs. Following our suggestion that this disease might be due to the presence of ergot in the munga grain included in pig feeds the stocks of munga held by the Grain Marketing Board at Fort Victoria were inspected and bulk samples selected for feeding trials. Concentrated samples of ergot infected grain were also obtained by flotation and by a gravity separator for use in more critical feeding trials.

MISCELLANEOUS

The Branch was represented on numerous Departmental and other committees including the technical committees attached to the four Seed Growers' Associations now established in Southern Rhodesia. The Chief Botanist and Plant Pathologist continued to be a member of the Federal Scientific Consultative Committee and, in this capacity, was closely associated with the activities of Mr. D. G. Kingwill during his study of the organization of scientific research in the Federation. He also continued his duties as Liaison Officer for the Commonwealth Agricultural Bureaux in the Federation and as a member of the Scientific Council for Africa.

CHEMISTRY BRANCH

DR. H. WEINMANN
CHIEF AGRICULTURAL CHEMIST

GENERAL

The year 1957-58 brought a number of staff changes in the Branch, the most important one of which was the appointment of Dr. B. S. Ellis, who had been Chief Agricultural Chemist since 1951, to the post of Director of Research and Specialist Services. After an interim period of nearly three months, during which Mr. R. G. Thomas was Acting Chief Agricultural Chemist, Dr. H. Weinmann was appointed Chief Agricultural Chemist. Three Professional Officers, Dr. Mullen, Mr. Croft and Mr. van Wyk, resigned during the year, the last named after only a few months of service. Fortunately, the Branch was able to recruit five new Professional Officers during the year, namely Messrs. Thornhill, Metelerkamp, Tillet, Pearl and Dr. Thompson, so that by the end of the year all but two vacancies had been filled.

While the changes in the staff undoubtedly exerted a disturbing influence on the work of the Branch, the output for the year was nevertheless high, and the total number of samples analysed and reported upon during the year (7,130) was only slightly lower than that for the preceding year (7,276). The following table shows the number of samples analysed by the various sections, though it must be remembered that such figures are not fully indicative in the case of the Research Section and not applicable at all to the work of the Soil Survey Section.

NUMBER OF SAMPLES ANALYSED IN 1957/58

General Section	1,904
Soil Testing Section:	
Advisory	2,647
Investigatory	746
Research Section:	
Pasture Chemistry	1,187
Investigatory	646
TOTAL	7,130

While the activities of the four Sections of the Branch are dealt with in detail below, some outstanding features deserve special mention.

In the General Section, the official control of fertilizers and farm feeds has received considerably more attention than in previous years. This is reflected in the large number (115) of farm feeds and fertilizers sampled and analysed under the provisions of the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1952. Special emphasis was laid upon the sampling of farm feeds, and samples were taken not only in Salisbury but also in other centres in Southern Rhodesia. In several cases, where the products of certain firms did not conform with the registered analysis or where the regulations of the Act were not being complied with in some other respect, appropriate action was taken in close co-operation with the Registering Officer of the Ministry. Though official control must remain in the hands of the Government, the formation of the Standards Association of Rhodesia and Nyasaland, with which the Branch maintains close contacts, will, without doubt, result in a general improvement of the standards of stock feeds in the not too distant future.

The Soil Testing Section had this year, for the first time, the full benefit of the new laboratory facilities. This has resulted in a greatly increased efficiency and has raised the weekly output of analytical work to such an extent that the backlog of analyses experienced in previous years could be avoided. It has, nevertheless, become apparent that unless the Technical Staff of the Section is increased, thus releasing the more junior Professional Officers for the specialist task of making fertilizer recommendations, the full benefit from the improved material facilities is unattainable and backlogs in the issuing of reports cannot be avoided.

The Soil Survey Section which at the beginning of the year was practically non-existent as a functional unit, has again been built up to a certain degree, consisting now of the Senior Officer-in-Charge and three (relatively new) soil chemists. The latter have stood the test of an exceptionally rigorous field season and have gained a certain amount of technical knowledge and practical experience. The lack of more experienced personnel (apart from the Senior Officer), brought about by the secondment of two pedologists to the Department of Conservation and Extension, is nevertheless sadly felt, and unless the Section is restored to its previous

numerical strength and until some of its junior members have reached the standard of their predecessors, it is difficult to see how it can properly fulfil all its obligations.

The Research Section has been more seriously affected in the past year by the resignations of staff than any of the other Sections, and is, in fact, now completely re-staffed with new Professional Officers. Fortunately, one of these is an experienced physical chemist, who could be placed in charge of the spectrographic laboratory, and at last a start has been made with the long planned investigations on minor elements. Apart from this, the scope of research work carried out by the Section has been widened considerably to include studies on the breakdown of soil organic matter and on soil moisture. In these fields there is urgent need for the establishment of posts of soil microbiologist and of soil physicist; the former is required to assist in work being started at Grasslands on rhizobium and the latter to co-operate in Hydrological work supported by the Hydrological Co-ordinating Committee.

Although the amount of research data obtained during the year has once more been satisfactory, the gap between the accumulation of data and their critical evaluation and processing for publication, to which attention was drawn in last year's report, again gives cause for concern. This has largely been due to the lack of continuity in staff devoted to research and to attempts to maintain, nevertheless, work on urgent problems with an inadequate, and often inexperienced staff. The evaluation and processing of all the data now accumulated is most important and it is to be hoped that some measure of staff stability has now been achieved so that it may be undertaken in the near future.

As in previous years, the Chief Agricultural Chemist and the Senior Officers of the Branch have again been engaged on numerous outside activities, including membership of certain Committees, attendance at conferences and meetings, lecturing to courses, etc. Thus, Dr. B. S. Ellis as Chief Agricultural Chemist, in October, 1957, attended a joint meeting of the Councils of S.P.I. and B.I.S. at Yangambi, Belgian Congo, and furnished a comprehensive report on this meeting. In February he visited Maguga, Kenya, to attend a four days' Conference of the High Commission Territories, and at the same time studied the organization and work of the East African Agriculture and Forestry Research Organization. In the earlier part of the year, Dr. Ellis spent a large part of his time with the Federal Standing Committee for Agricultural Production and also served on the editorial sub-committee which was responsible for framing the report on "Agricultural Policy in the Federation of Rhodesia and Nyasaland".

Dr. H. Weinmann attended the meetings of the Departmental Research Advisory Committee. He also served on the Technical Committee for Animal Feeding Stuffs of the Standards Association of Rhodesia and Nyasaland, and together with Mr. Bushnell, represented the Branch at the meetings of the Agalactia Committee. Dr. Weinmann also attended the African Weed Control Conference at the Victoria Falls in July, 1958.

Mr. R. G. Thomas served on the Committee for the production of wheat on moisture-retaining soils, and gave lectures to two farm-planning courses and two irrigation courses for Conservation and Extension Officers, and to two farm-planning courses for Land Development Officers. In co-operation with Messrs. Staples and Vincent, he spent a considerable amount of time on editing the Agro-ecological Survey Report.

Dr. D. H. Saunder continued to serve on the Hydrology Co-ordinating Committee and on the Kafue Pilot Polder Advisory Committee. He was appointed to serve on a Committee established by the Secretary to draw up a report on the possibility and implications of subsidizing nitrogenous fertilizer in the Federation. Dr. Saunder also served on departmental committees concerned with wheat and with lucerne production and was appointed C.C.T.A./C.S.A. correspondent for the Federation on the use of Radioisotopes in Agriculture. He lectured to courses on Farm Planning and Irrigation, organized by the Department of Conservation and Extension, and to final year students at the Gwebi Agricultural College. He was also appointed to act on the Editorial Advisory Committee concerned with the production of the Rhodesia Agricultural Journal.

As in the past, the Branch has worked in all matters of common concern in close and harmonious co-operation with the Research Stations, other Branches and Departments of both the Federal and Territorial Governments, with non-Governmental bodies and institutions and, in fact, with the Governments of other countries.

Thanks are due to all members of the Staff who, under often trying circumstances, have untiringly done their best. I wish to mention particularly Mr. R. G. Thomas, who at a crucial time had the difficult task of acting as Chief Agricultural Chemist in addition to his duties as head of a section.

It is with pleasure and appreciation that I also wish to record here the name of Mr. Matiyenga Simon, African Senior Laboratory Hand, who recently left the Branch on retirement after 30 years of loyal and efficient service.

A detailed account of the activities of the individual sections follows.

GENERAL SECTION

This year has seen a marked increase in the number of samples analysed, reaching a total of 1,904 compared with 980 samples for the year 1956-57. This is essentially due to the large number of blood samples analysed but increases are also seen in various of the other main groups of materials received. It has been possible this year to keep a closer control of products that come within the scope of the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1952, although there is still a need for more complete control; this applies in particular to fertilizers.

Although there have been several staff changes in this section due to promotion or resignation, these alterations have not interfered greatly with the normal flow of work, and certainly no particular phase of work has been handicapped.

A breakdown of the materials analysed during the year is given in Table I, followed by comments on each particular group or sub-group.

TABLE I

SAMPLES ANALYSED BY THE GENERAL SECTION IN 1957/58

Fertilizers, Manures and Limes:	
Fertilizers	40
Fertilizers (under the Act)	11
Compost and kraal manures	8
Miscellaneous manures, woodashes, etc.	5
Limes and Limestones	8
Farm Feeds and Vegetable Products:	
Farm Feeds	65
Farm Feeds (under the Act)	104
Cereals	24
Legumes	68
Tobaccos	4
Grasses and Silages	23
Other Vegetable Products	175
Animal Products:	
Blood samples	642
Miscellaneous Animal Products	30
Oils	11
Essential Oils	1
Waters	34
Toxicological Specimens:	
Analyses for Arsenic (positive)	351
Analyses for Arsenic (negative)	232
Other poisons	27
Protection Products:	
Arsenical Dips	19
Organic Dips	1
Miscellaneous	21
TOTAL	1,904

Fertilizers and Manures. There has been a definite decrease in the number of samples analysed in this group compared to the previous year, namely, a drop of 106 to 64 samples. This may be due, in the main, to a decreasing interest in guano products as only seven guanos or guano mixtures were received. Approximately 60 per cent. of this group in this year were ordinary inorganic fertilizers, while eight composts and manures and five other manuring materials were analysed. Eleven samples of fertilizers from commercial concerns were sampled and analysed under the provisions of the Act.

Limes and Limestones. Five limes or limestones were received for analysis, the same number as for 1956-57.

Farm Feeds. One hundred and sixty-nine farm feeds were analysed in this year compared to the 1956-57 total of 77. A large proportion of this increase is in

the number of samples analysed under the provisions of the Act: one hundred and four compared to 35 for 1956-57.

The majority of the remaining 65 samples were submitted by farmers compounding their own feeds.

Vegetable Products. The total of 294 samples in this heterogeneous group greatly exceeds last year's total of 172, but includes two sets of samples from experiments: one hundred and sixty-two potato samples analysed for specific gravity and moisture content from the Salisbury Agricultural Experiment Station and 53 Soya bean hay samples for protein from Gwebi Agricultural College.

Also analysed were 11 samples of rapoko for germination and diastatic power in connection with the brewing of Native beer at the Salisbury Municipal Brewery, eight maize meal samples for screening tests, and six sets of potato leaves for various nutritional problems. Other materials reported in this group were, samples of wheat, sugar-cane, lima beans, and tobacco seed and scrap.

Animal Products. The major proportion of the 672 samples in this group were 642 blood specimens. Four hundred of these were in connection with aphosphorosis investigations conducted in Matabeleland by the Veterinary Department in co-operation with this section. These investigations were mainly exploratory in trying to establish a correlation between sub-clinical aphosphorosis and the level of inorganic phosphorus in the blood. A further 194 blood phosphorus determinations were carried out for the Matopos Research Station in connection with certain feeding experiments. The remaining 48 blood samples were submitted by the Veterinary Research Laboratory for either calcium, magnesium or inorganic phosphorus determinations.

Eighteen samples of bones, analysed for their total ash content, were reported on to the Animal Husbandry Officer, Henderson Research Station.

The number of ox-gall samples analysed, 11, remained at the same level as for the previous year.

Oils. Only 11 samples of oil were analysed as compared to the previous year's total of 36 samples. This total comprised two Neatsfoot oils from the Cold Storage Commission and nine samples of ground nut oil where analysis certificates for export were required.

Essential Oil. A sample of Bursera sp. was received for essential oil extraction and determination.

Waters. In all, 34 samples of water were analysed in connection with varying problems: eight samples of irrigation water, one sample for use in hydroponics and two samples in connection with corrosion problems. Ten water samples were analysed for their calcium content as part of the aphosphorosis survey.

Toxicology. The number of toxicological specimens has risen considerably, from 427 for the preceding year up to 610 for this year. There is a tendency for the examination to cover a wider field than merely an arsenic determination. However, nearly 60 per cent. of the specimens examined were found to contain arsenic.

Dips. Arsenical dips continue to account for the majority of the samples in this group amounting to 19 out of 20 samples. One organic dip was sampled and analysed under the provisions of the Act at the request of the Veterinary Department.

Miscellaneous. Twenty-one samples of extremely varied types of material were reported on, ranging from two salt samples from the Cold Storage Commission to four rayon samples contaminated with an unknown oil.

Apart from the analytical work, the Section supplied 77 Winchester Quarts of Standardized iodine solution for dip testing to the Veterinary Department and 22 Winchester Quarts of Standardized Sodium hydroxide solution to the Dairy Branch.

The Section has also been responsible for the monthly collection of rain water and its despatch to the U.S.A. Atomic Energy Commission, for the purpose of measuring radio-active fall-out.

SOIL TESTING SECTION

The number of samples submitted to the Soil-Testing Laboratory during the year was slightly more than 20 per cent. higher than during the preceding year. A total of 3,754 were received, 3,223 for advisory purposes (fertility assessments and

fertilizer recommendations) and 531 research or investigatory purposes. Comparative figures are given in Table II.

TABLE II

SOIL SAMPLES RECEIVED

	1956/57	1957/58	Increase
Advisory:			
For full fertility analysis	2,507	2,897	390
For partial analysis	286	326	40
Total advisory	2,793	3,223	430
Investigatory and Research	302	531	229
Grand Total	3,095	3,754	659

Reports were issued on 3,393 samples, of which 2,647 were advisory and 746 research and investigatory. Among the advisory samples the majority were, as usual, for flue-cured tobacco (51 per cent.) and maize (24 per cent.). Southern Rhodesian farmers again made by far the greatest use of the service (87 per cent.), with approximately the same small proportion (12 per cent.) coming from Northern Rhodesia as in the previous year. Nyasaland contributed a negligible number of samples. Details are given in Table III.

TABLE III

SOIL SAMPLES UPON WHICH REPORTS HAVE BEEN ISSUED

	Southern Rhodesia	Northern Rhodesia	Nyasaland	Outside Federation	Total
Advisory:—					
Tobacco: Flue-cured	1,191	150	3	3	1,347
Turkish	11	2	2	—	15
Burley	2	1	—	—	3
Seedbeds	26	—	—	—	26
Maize	505	127	—	—	632
Potatoes	59	5	—	—	64
Other field crops	57	7	—	—	64
Pastures	45	9	—	—	54
Lucerne	27	—	—	—	27
Vegetable and Market Gardens	79	7	—	1	87
Fruit trees	24	6	—	—	30
Private Gardens	211	4	—	—	215
Sports Clubs	35	—	—	—	35
Miscellaneous	42	6	—	—	48
Totals (advisory)	2,314	324	5	4	2,647
Investigatory:—					
Chemistry: Research	428	—	—	—	428
General	15	—	—	—	15
Research Stations	56	—	—	—	56
Conservation and Extension Trials	113	23	—	—	136
Other Government Departments	37	—	—	—	37
General Public	58	—	—	—	58
Tanganyika	—	—	—	16	16
Totals (investigatory)	707	23	—	16	746
GRAND TOTALS	3,021	347	5	20	3,393

This year for the first time the full facilities of the new laboratory were available. This has greatly increased efficiency, and, without any additional staff, it has been possible to raise the weekly out-put of samples analysed by 50 per cent., while maintaining higher standards of accuracy than in the past. As a result, the unfortunate backlogs in analysis, which have been a regular feature in recent years, have been completely avoided, in spite of the greater number of samples received and a record seasonal peak. Material facilities alone could not, of course, have achieved this result; considerable credit is due to the analysts, and the junior officer responsible for the daily running of the laboratory, who have worked enthusiastically as a team to make the most of the new facilities.

Unfortunately, the whole picture is not as bright as the laboratory aspect. During the latter part of the busy season a serious backlog developed in completed analyses awaiting fertility assessments and reporting. (It is mainly for this reason that the number of samples received is considerably greater than the number upon which reports were issued.) Fertility assessment and reporting is the most exacting part of the work of the Section, and hitherto it has been done only by experienced senior officers, both as a matter of policy and of necessity. Normally the senior officer in charge of the Section is solely responsible for this work, but numerous other responsibilities, both administrative and consultative, not directly connected with soil testing, devolve upon him. In special circumstances, such as arose this year, it is not always possible to give the priority to the routine of the Soil-Testing

Section that it should have. As a result the efficiency of the Section as a whole is, at peak periods, often far below that of the actual laboratory.

In fact it has become apparent that improvement in laboratory facilities and efficiency must be balanced by concomitant improvement on the assessment and reporting side. To do this it is proposed to train suitable, but more junior officers in this work, a step that has not been practical until recently. Little will be gained, however, unless the staff of the Section is appropriately increased.

SOIL SURVEY SECTION

The year commenced with the Section in a state of virtually suspended activity. From a vigorous unit of six pedologically-trained chemists, a chain of events had whittled it down in less than two years to the senior officer and three newly-appointed chemists, without field experience. Finally, Mr. Thompson, the senior officer, had been appointed to a five-month F A.O. study fellowship in the United States of America.

Mr. Thompson returned in December having made a profitable study of many and varied aspects of soil-survey work, both in the field and the laboratory, with particular emphasis on practical applications such as soil classification for land-capability assessments and irrigation. Many new ideas and techniques were brought back which remain to be tested under local conditions and, where suitable, adapted and introduced; but fundamentally it was found that the general approach and objectives of the Section are in close accord with the best American practice. This is gratifying, but not surprising, since not only have senior officers visited America, but we have freely borrowed from American handbooks, adapting their published methods to local needs and facilities, and constantly striven for a high standard of scientific discipline.

With the return of the senior officer, the main objective for the year became the resuscitation of the Section and building of the new personnel into a practical team. During the summer months, analysis of reference samples, taken early in the previous field season, was used as the means of introducing the staff to soil-survey laboratory methods; by the beginning of the field season in April all were thoroughly conversant with the standard analytical methods of the Section. At the same time some work was done on a routine revision of analytical procedures, but in the circumstances this did not progress far. All possible opportunities were also taken for giving staff preliminary elementary instruction in field methods.

During this period two small surveys were undertaken, of which one was an urgent investigation for the Native Department of the Tawona Extension Irrigation Project in the Sabi Valley.

The field season began in April with the commencement of a soil reconnaissance of the Southern Rhodesian portion of the Zambezi Valley below Kariba Gorge. This was planned as a semi-detailed reconnaissance similar to that carried out in recent years in the Sabi Valley. Soils were to be classified and mapped, both in fundamental pedological units and in irrigability classes, with an accuracy suitable for detailed planning. The target set was completion of the area between the Gorge and the Salisbury-Chirundu Road, but it was not anticipated that this would be achieved, because the senior officer was the only member of the party with field experience, and thorough training of the other members was an urgent necessity. For the first month, by special arrangement with the Director of Conservation and Extension, one of the seconded pedologists returned to the Section and accompanied the party to assist with preliminary training.

From the outset serious difficulties were encountered. The few access tracks that once existed were either densely overgrown or still impassable as a result of the record Zambezi floods. The arduous task of clearing them and hacking out new tracks, often through impenetrable thicket, was further retarded by labour difficulties. Casual labour could not be obtained locally and had to be recruited in Salisbury, and it was some time before a stable force could be built up.

Once the area had been penetrated sufficiently to enable soil work to begin, more serious difficulties arose. Air-photographs are the basis for mapping in all modern soil-survey work, but the only photographs of the area available were on too small a scale and of too inferior a quality to be suitable for the detail originally planned. Ground positions could be pin-pointed only with difficulty and then not accurately and at infrequent intervals; and vegetation types, with which soils were correlated, could not be distinguished on the photographs.

Since the means were not available for mapping accurately the soils identified and their boundaries, it was reluctantly decided to adopt a broader and

less detailed basis for the reconnaissance. This proved successful and good progress was made; in fact the original target was achieved before the end of the season and the reconnaissance was carried down-stream of the Salisbury-Chirundu Road, almost as far as the Reckomitje River. The detail mapped is adequate to provide a clear picture of the main categories of soil, their distribution, and their irrigation potential, and it will enable broad land-use planning to be made.

The difficulties of the season are not without value. They have tested and proved the new personnel of the Section who have shown aptitude and unbounded enthusiasm, with one exception. This refers to an officer who was appointed shortly before the field season began and resigned within two months, because he could not stand the pace.

RESEARCH SECTION

A considerable volume of research and analytical work was carried out by the Section in the year under review, and a brief description is given under the following headings:—

Pasture Research. The number of samples submitted from pasture experiments on research stations was less than last year owing to the establishment of the laboratory at the Grasslands Research Station where most of the routine work for that station has been carried out by Dr. Hava.

Analytical work on the 1957-58 digestibility trials at the Henderson Research Station involved a larger programme than in previous years. The method used for determination of chromic oxide in faeces has been revised to give a greater accuracy than that previously obtained. A method of lignin determination was also developed in order to test the theory that the sudden drop in weight of livestock might be correlated with an increase in lignin content together with decreased digestibility of the pasture grasses. Results, however, do not show any sudden increase in lignin content.

A method for the determination of true protein nitrogen and non-protein nitrogen has also been tested and is being tentatively applied to pastures at Grasslands.

A number of pasture and soil samples have been analysed at regular intervals throughout the year, in conjunction with blood samples, reported by the General Section as part of an investigation into the incidence of aphosphorosis in the Fort Rixon and Shangani areas and in connection with phosphate feeding trials at Matopos and Nyamandhlovu. The incidence of chemical aphosphorosis has been clearly established, but, as the full correlation of soil, pasture and blood analyses has not yet been made, it is not known to what extent it may be possible to predict the areas in which this deficiency is likely to occur.

Lysimeter leachate samples have again been analysed for the Matopos and for Grasslands Research Stations. It is interesting to note that whereas leachates from plots under maize carried appreciable amounts of nitrogen, those from plots under grass carried none.

The total number of samples analysed during the year was as follows:—

Pasture samples	457
Lysimeter Leachates	74
Silages	16
Digestibility trials	565
Aphosphorosis investigations	58
Miscellaneous	17
TOTAL	1,187

Field Trials and Soil Fertility Correlations. As in previous years, soil samples were analysed from field trials carried out by the Department of Research and Specialist Services, the Department of Conservation and Extension, the Native Agriculture Department and such bodies as the Tobacco Research Board. These analyses were carried out by, and are reported by, the Soil Testing Section, whilst the field data, when available, are correlated with analytical data in the Research Section.

During the course of the year all the available data were critically examined from the point of view of their interpretation in terms of fertilizer requirements and completely revised notes and tables for the assessment of fertilizer requirements were drawn up for the guidance of reporting officers in the Soil Testing Section.

Analytical work has continued on the green-manure trial conducted on the Salisbury Agricultural Experiment Station; a further 64 samples (soils and soya

bean herbage) were analysed. A large amount of interesting analytical data is now available from this trial but so far the main reason for the "green-manure benefit" appears to be in its effect upon available soil nitrogen. It is interesting to note that in this trial the legume plots which are cut and removed at the same time as those which are turned in (before the legume is mature) also show a considerable nitrogen benefit.

Soil Physics

(a) *Moisture Relationships.* New apparatus for soil moisture studies, consisting of pressure-membrane and porous-plate equipment, was installed and put into operation. Soil moisture/tension curves have been obtained for most of the main soil types found in Southern Rhodesia; in all, 28 soils have been examined. These data, which it is intended to publish shortly, provide very useful information on the moisture characteristics of our soils and should be of considerable practical value, particularly in assessing irrigation requirements.

(b) *Evapotranspiration.* In order to obtain data on evapotranspiration losses under winter cropping, soil samples have been taken at regular intervals from the irrigated wheat, water-metered plots, at the Henderson Research Station. Gravimetric determination of soil moisture at different depths is made and both the water-loss between irrigations and the effective rooting depth can be determined. This work is still in progress; 188 soil samples have so far been taken.

The officer who is doing the work is also a member of the joint Evapotranspiration Project team at the Henderson Station and will co-operate in work carried out there on summer crops during the coming season.

(c) *Clay Mineral Analysis.* Equipmment for differential thermal analysis of clays was installed during the year and will, it is hoped, provide a useful tool in the classification of soils.

Soil Organic Matter Studies

(a) *Nitrogen Availability.* Work continued during the year on the release of nitrogen from soils, at Grasslands and the Salisbury Experiment Station, where both indigenous and established grass covers were turned in at different times and stages of maturity. Both incubation studies and pot experiments, in which the total uptake of nitrogen by a cereal test crop was determined, were carried out. This involved analysis of 148 samples (herbage and soil).

The results again show a correlation between release of soil nitrogen on incubation and crop removal of nitrogen in the pots, but the correlation obtained was not as close as last year. The time of ploughing was found to have a very large effect upon the availability of soil nitrogen but whether or not the aerial grass cover was turned in was found to make surprisingly little difference to nitrogen availability. A direct correlation was again obtained between release of soil nitrogen on incubation and crop removal of nitrogen in pots. Although this correlation was not as close as last year it would still appear that in interpreting incubation data in practice comparatively little allowance needs to be made for the effect of coarse unrotted grass removed from such soils during the course of their sampling and preparation before incubation. This means that fertilizer-nitrogen recommendations, based on incubation data, may be made more directly and with greater confidence on such soils than was formerly thought to be possible.

(b) *Rate of Breakdown of Organic Matter.* During the year ten "soil respirometers" were constructed to a design similar to that described by Dr. Birch of the East African Agriculture and Forestry Research Organization. In these respirometers the rate of oxygen consumption by soils is measured during their incubation. In the work now being conducted in this Branch both carbon dioxide and nitrate formation on incubation are being simultaneously followed thus giving a very full picture of the microbiological activity in the soil and the rate of breakdown of organic matter.

It is intended to study the breakdown of organic matter in a variety of different soils under different conditions and under different cropping systems. So far, 22 different soils have been incubated in the respirometer and the results are now being worked out. One particularly interesting result appears to be that despite the widely differing initial rates of oxygen consumption of different soils, depending on their history, the rate of consumption of most soils of the same type and texture decreases to much the same uniform level after about three weeks' incubation.

Mineral Nutrition

Work on problems of minor element nutrition now forms a major part of the research programme.

A considerable amount of time has been spent during the year on testing and adapting methods of analysis, particularly spectrographic procedures.

(a) *Spectrography.* In the spectrography laboratory, problems of reproducibility and sensitivity in the analysis of plant ashes, with particular regard to minimising the effect of variations in ash composition by the use of suitable spectroscopic buffers, have been largely resolved. Working curves for simultaneous determination of most of the important elements, including boron, have been prepared and it is now possible to carry out direct quantitative ash analyses with adequate sensitivity for most elements except Zn, Co and Mo. Work has been started on the application of concentration procedures to these more difficult elements.

(b) *Bio-assay Procedures.* The use of *Aspergillus niger* for the biological determination of "available" minor elements in soils is being investigated in collaboration with the Branch of Botany and Plant Pathology who have supplied the necessary culture facilities. Preliminary results with this difficult technique have so far been disappointing, largely as a result of contamination of the nutrient media.

(c) *Chemical Procedures.* Work on chemical procedures for determination of available nutrients in soils is continuing.

Further samples have been taken for the "mineral survey" in which plant nutrient contents are being compared with soil nutrient contents determined by different procedures. This is a long term programme and it will be some time before sufficient results are available for even a preliminary assessment of the distribution of minor elements in different areas and the most suitable methods for their estimation in soils, to be made. Forty-one samples of soils and grasses were analysed during the year.

Work on Nickel and Chromium toxicities in Great Dyke soils has continued, with particular emphasis on establishing a reliable procedure for the estimation of "available" soil chromium. Although reliable methods for estimation of "available" soil nickel have been established, as reported last year, little progress has been made, despite some 66 analyses, with procedures for chromium. It would appear that test cropping in pots provides the best check on possible chromium toxicity and maize has been found to give a sensitive and quick result. This work is now being prepared for publication.

A novel procedure for the physico-chemical determination of boron was developed during the year. Following distillation of the boron as methyl borate and its conversion to boric acid, the boron is determined by the pH shift produced when invert sugar is added to the boric acid. Unfortunately, this method has not yet been published owing to the resignation of the officer concerned before it had been thoroughly tested.

Further data on the use of an anion exchange resin for determination of "available" soil phosphate, described last year, were obtained. Thirty-three soils of known phosphate response were analysed. This procedure would appear to be of considerable value, particularly when used in addition to the routine alkali-extraction procedure. It has not yet been possible, however, to complete the statistical analysis of the data.

(d) *Nutrient Uptake of Tobacco.* Work on this was continued during the 1957-58 season, four plots of tobacco being harvested on Mr. Huddy's farm, Russeldene. The analysis of 28 samples of leaves, tops, suckers and stalks collected in the 1955-56 and 1956-57 season has been completed. Average results, so far obtained, for a yield of 1,500 lb./acre of cured leaf, are as follows:—

Yield	*Nutrient uptake lb./acre*				
Cured leaf lb./acre . . .	N	P_2O_5	K_2O	CaO	MgO
1,500	49	14	84	42	23

It is interesting to note that these uptake figures are, for calcium, magnesium and, particularly, potassium, somewhat lower than those reported by certain American workers.

In conjunction with the work, tests were conducted to determine dry matter loss during curing.

Miscellaneous

A number of minor investigations were handled during the year.

Aluminium toxicity, due to soil acidity, was diagnosed in Sorghum plants from the Matopos Research Station. Nine soils were examined from the veld

fertilizer trials at Matopos to determine the reason for the lack of response to nitrogen. Six grass samples from Charter Estates were analysed in connection with experiments conducted by the Veterinary Department to assess the incidence of deficiencies of copper and cobalt in that area. These samples were, however, found to contain normal amounts of these elements. Four further herbage samples from the trace element trial at Lukampa, conducted by the Native Agriculture Department, showed low figures for cobalt but adequate figures for copper. Three calves' livers were also analysed for copper and cobalt in connection with mineral feeding trials at the Henderson Research Station.

PUBLICATIONS

D. H. SAUNDER. Mixed farming systems and maintenance of soil fertility. Proceedings of the Third Annual Conference of Professional Officers of the Department of Research and Specialist Services, 1957. Federal Ministry of Agriculture, Rhodesia and Nyasaland.

CROP PRODUCTION

T. K. SANSOM,
CHIEF AGRICULTURIST

Seasonal Conditions. The 1957-58 season has been one of extremes. Record high and low monthly totals were reported; in many areas the season was a poor one, yet it produced phenomenal floods in the Zambezi. The season started late, particularly in Southern Rhodesia, where there was a marked deficiency of early rains.

The new year was notable for the activities of cyclone "Astrid" which, after causing damage in the Moçambique coast, crossed the south of Southern Rhodesia in a fairly quiescent state only to strike the north face of the Zoutspoonberg with renewed fury, seriously disrupting communications with Southern Rhodesia.

The rains ended suddenly about the first week in March. This sudden cessation was the cause of the reduced crop of maize as the grain was not able to fill out properly due to lack of moisture supply.

THE MAIZE CROP

Estimate of Yields. The steady expansion which has taken place in the maize crop during the period 1950-51 to 1956-57 was checked during the 1957-58 season, as the following table shows.

Season	Number of Growers	Area Planted	Crop Reaped	Yield per acre
1950/51	3,916	343,521	1,176,528	3·42
1951/52	4,095	361,024	2,454,047	6·80
1952/53	4,176	363,204	2,360,011	6·50
1953/54	4,154	359,709	2,687,314	7·50
1954/55	4,170	364,059	2,734,920	7·51
1955/56	4,087	342,509	3,434,797	9·74
1956/57	4,162	371,062	3,777,021	10·2
1957/58 (estimated)	4,100	340,000	3,400,100	10·0

This reduction in total yield and yield per acre was due to late planting rains and the cessation of rains early in March. The past season was by no means a good one, but it is quite possible to have a worse season such as one in which a drought could occur at the critical time of flowering in January. In this event, total yields and yields per acre could be very considerably reduced.

Southern Rhodesia Seed Maize Association. The Southern Rhodesia Seed Maize Association and Government continue to employ two full time inspectors, but an arrangement has recently been made whereby a temporary inspector has been appointed who will do inspection duties if one of the permanent inspectors falls ill or is not able to perform his duties due to other causes.

Final Report for the 1956-57 Season. The season under review is the ninth since the introduction of hybrid maize. Fifty-five members delivered seed for sale, while seventeen others produced for their own use only. One member's crop was disqualified. The area under seed for sale was 3,450 acres and the yield was approximately eight bags per acre. Total sales amounted to 28,434 bags of 200 lb. each, of which 6,750 bags were sold in Northern Rhodesia as compared with 5,000 bags sold in the previous year. The total included 1,200 bags of butts which were called in late in the season in response to urgent appeals from farmers who had lost their early sowings owing to drought conditions which prevailed in November and early December.

Although total deliveries exceeded estimated requirements, twelve members were unable to deliver their allotted quotas, mainly owing to misfortune due to climatic conditions.

Interim Report for the Season 1957-58. The total area planted for the production of seed amounted to 3,675 acres; this includes 105 acres planted in response to the Association's request that members should increase their acreages. The area planted represents approximately 100 acres more than in the year before. In spite of unfavourable weather conditions, nearly all members' crops were satisfactory and there will be few who will not be able to fulfil their quota requirements.

During the past year, membership has increased by five and one member, who in the past has grown solely for his own use, has applied for a sales quota.

The growing season was the most difficult experienced since the commencement of hybrid seed production, as incessant showers during January and February made detasselling extremely difficult and uncomfortable. Most growers had difficulty with the large proportion of plants whose leaves did not unfold in the normal manner, particularly when dressings of nitrogenous fertilizers had forced the growth. This characteristic is traceable to the A 5.7.6 inbred which is used as the male parent of the single hybrid. It is anticipated that the new strains which have been bred at the Salisbury Experiment Station will eliminate this characteristic, as well as improve resistance to Helminthosporium turcicum.

The inspection of growers situated at a distance from Salisbury has been much more satisfactory during the past season, having been carried out in an efficient manner and results having been promptly reported.

In general, the past season's maize crop was not as severely attacked by Helminthosporium as those of the past few years. Members who have grown the new hybrid, which has the N3 - 1 - 3 - 3 inbred as one of the parents, report that it has more resistance to the disease than the N3 - 1 - 4 - 9 inbred.

Membership of the Association. The following table gives a comparison between the 1957-58 season and previous seasons.

Season	Total Membership	Producing Hybrid Seed	Total acreage grown	Seed available for sale in bags of 200 lb. nett
1948/49	57	40	350	1,774
1949/50	77	65	3,150	13,367
1950/51	91	69	3,275	17,226
1951/52	100	77	3,500	20,800
1952/53	96	80	3,113	20,500
1953/54	94	70	3,580	25,500
1954/55	90	68	2,765	25,000
1955/56	93	53	3,100	24,812
1956/57	92	72	3,450	28,434
1957/58 (estimated)	97	73	3,550	28,500

It will be noted that there is very little variation in the number of growers who are producing hybrid seed for sale or the acreage grown, but there has been a fairly considerable increase in production.

Hybrid Maize Farm. The second crop of single hybrid seed has been produced on Panmure Hybrid Maize Farm. Approximately a full season's requirements were grown and this, together with a carry over from the previous season, ensures almost a two year's supply of seed requirements. Again the seed produced is of exceptionally high quality and the very hot conditions at Panmure have not, up to the present, affected the growth of delicate inbred plants.

A new D2 Caterpillar tractor and heavy plough was purchased towards the end of 1957. Although the plough is not entirely satisfactory, it has been possible to complete ploughing operations well before the soil dried out to make it too hard for ploughing. With these new implements it will be possible to bring the lands into a good state of tilth, which was not previously possible with the old, worn out, under-powered implements.

Seed was distributed for the first time to members of the Southern Rhodesia Seed Maize Association from Panmure. Previously it had been distributed from the Salisbury Experiment Station. Revenue from the sale of single hybrid seed has exceeded £5,000 during the past season.

The syphon under the Mazoe River and irrigation canal have now been completed. This will ensure successful crops even during periods of drought during the growing season.

Small acreages of wheat produced by the Wheat Breeder have been planted during the past winter in order to bulk up supplies of seed for distribution to farmers.

Fire-cured and Burley Tobacco experiments limited to a maximum of five acres a year have been conducted since this farm was taken over by this Ministry from the Shamva Fire Cured Tobacco Committee. These experiments are under the control of the Chief Tobacco Extension Officer.

Seed Maize Prices. There has been no change in the prices for seed maize during the present season, which remain as follows:—

Certified Double Hybrid Seed:— Large Flats and Medium Flats	£5 10s. 0d. per bag of 200 lb. nett.
Certified Double Hybrid Seed:— Large Rounds	£3 10s. 0d. per bag of 200 lb. nett.
Certified Double Hybrid Seed:— Small rounds	£3 5s. 0d. per bag of 200 lb. nett.
Certified Open Pollinated Seed	£4 0s. 0d. per bag of 200 lb. nett.

At present only Certified Double Hybrid Large and Medium Flat Seed is sold by the Southern Rhodesia Seed Maize Association.

SUMMER WHEAT

The acreage grown and the quantity of summer wheat produced was negligible. Small plantings were done by farmers, but these are unlikely to increase until a really satisfactory summer wheat is produced. Good progress has been made in this direction and it is confidently expected that within the next few years a variety or varieties will be bred which will stand up to the extreme conditions which exist during the summer. However, the weed problem is still one which has to be dealt with, as many of the most destructive weeds such as Rapoko grass can only be killed by selective weed killers which would also kill the wheat plant itself. It would appear that the most likely method of growing summer wheat would be to plant late when the majority of weeds could have been killed. The objection to this practice, however, is that the land would have to remain exposed to heavy rains with consequent danger of erosion.

As in the past, trial plots embracing fertilizer and spraying trials for weed control continue to be grown on the various Government Research Stations.

WINTER WHEAT

The 1957 winter wheat crop amounted to 12,099 bags, comprising 10,268 bags grown on 1,574 acres of irrigated land and giving an average of 6.5 bags an acre and 1,831 bags grown on 686 acres giving an average of 2.7 bags an acre. The total crop amounted to 3,342 bags less than in the 1956 season. The total yield represents only a fraction of the Colony's requirements and the yields per acre of both irrigated and non-irrigated could quite easily be doubled by adopting better farming practices.

SORGHUM PRODUCTION

Sorghum growing continues to attract little attention from farmers. It is unlikely that this crop will make any headway while a succession of good seasons continues. In the meantime, work is in progress at the Matopos Research Station on the introduction, selection and breeding of new varieties better adapted to the climatic conditions obtaining in the lower rainfall areas of the Colony.

RHODESIA SEED POTATO ASSOCIATION

The amalgamation, during the past year, of the Eastern Growers' Association and the Salisbury Area Potato Growers' Association has ensured much closer liaison between producers of seed in the Eastern Districts and growers of ware potatoes. The quality of seed marketed has greatly improved and there is an exceptionally keen demand for seed produced in the Eastern districts, and inspected and certified by members of this Department.

KENAF *(HIBISCUS CANNABINUS)*

There has been a great deal of interest shown in this crop during the past season and some growers have reported yields of over one ton an acre over large acreages. The decorticating machines made in Umtali have proved satisfactory but the bottle-neck in mechanization lies in the harvesting of the crop. Strenuous efforts are being made to produce a suitable machine. For the coming season it is expected that between two and three thousand acres will be grown which, if successful, should produce about a quarter of the country's requirements of fibre.

An Interim Fibre Committee, of which the Chief Agriculturist is Chairman, has been formed to co-ordinate all aspects of fibre production.

CASTOR BEAN

Oil produced from this crop is in great demand for use in the manufacture of plastics and in jet engines. World supply falls far short of demand. There has been considerable interest shown in this crop, especially in the lower rainfall areas of the Colony, but unfortunately it has been attacked by a number of diseases and insect pests. Work is, however, in progress at the Matopos Research Station in an endeavour to produce other varieties, as this crop can undoubtedly be a useful alternate cash crop, especially in the lower rainfall areas.

AGRICULTURAL SHOWS

The Chief Agriculturist and staff judged the maize, agricultural produce and

districts sections at the Salisbury, Bulawayo, Gwelo, Umtali, Gatooma, Fort Victoria, Sinoia, Bindura and Beatrice Shows. With one or two exceptions, the standard and number of exhibits were disappointing and it is considered that the time has now arrived when serious consideration should be given to a reduction in the number of shows each year.

AGRICULTURAL EXPERIMENT STATION, SALISBURY

SEASON

The growing season was one of the shortest the station has experienced. In the seven months from October to April, 28.52 inches of rain fell and, of this total, 23.74 inches fell between December 9th, the first germinating rain, and the 28th of February. The abnormally short season favoured early maturing types in all variety trials and, in many cases, the results were more an indication of early maturity than of true yielding ability.

STUBBLE MULCHING AND TRASH FARMING

Maize Stalk Treatments

A=Control. Stalks cut just above ground level and removed.
B=Stalks ploughed back (trash farming).
C=Stalks chopped and left on the surface as a stubble mulch.
D=Stalks removed and a dressing of two tons of kraal compost per acre ploughed back.

Nitrogen Treatments

1=500 lb. Sulphate of Ammonia applied in mid-winter (at ploughing).
2=500 lb. Sulphate of Ammonia applied to the maize six weeks after planting.
3=500 lb. Sulphate of Ammonia applied half in mid-winter, half at six weeks.

YIELDS OF GRAIN (IN BAGS OF 200 LB. PER ACRE)

Stalk / Nitrogen	A	B	C	D	Means
N1	19·95	22·84	17·53	20·25	20·14
N2	16·35	16·60	13·79	17·57	16·07
N3	18·34	19·05	16·27	20·40	18·52
Means	18·21	19·49	15·86	19·41	—

L.S.D. = 1·0 bags per acre (N means).
L.S.D. = 1·2 bags per acre (Stalk means).

Whilst both system B, ploughing the stalks back, and system D, removing the stalks and returning compost at the rate of two tons per acre, have given significantly higher yields than the control, or clean cultivated, plots, system C, where the stalks are left on the surface as a stubble mulch, has given significantly lower yields than the control. It is thought that the establishment of a surface mulch may have lowered the soil temperatures and that the reduced yields may be attributable largely to this temperature effect. In each of the four seasons during which this trial has been in progress, rainfall has been adequate for crop production at a high level. It will be interesting to see if stubble mulching compares more favourably with the other stalk treatments in the trial in a year of drought, when the surface mulch may have a beneficial effect if it prevents the run-off of what rain does fall.

At this stage any conclusions drawn from the results in this trial may be premature. Nevertheless, it is interesting that the effect of stubble mulching maize lands in Rhodesia has so far been very similar to the experience of farmers in the Corn Belt of the United States.

MAIZE BREEDING

Hybrids developed on this station were first grown on a commercial scale in Southern Rhodesia during the 1949-50 season. The following are the comparative yields which these hybrids and open-pollinated varieties have given since that season (figures supplied by the Central African Statistical Office).

Season	Hybrid Varieties			Open-pollinated Varieties		
	Acreage	Yield in B.P.A.	Bags of Maize	Acreage	Yield in B.P.A.	Bags of Maize
1949/50	74,732	7·96	595,139	—	4·61	—
1950/51	199,478	4·19	836,275	144,043	2·36	340,253
1951/52	221,514	8·05	1,783,276	139,510	4·81	670,771
1952/53	233,653	7·62	1,780,704	129,551	4·47	579,307
1953/54	237,515	8·66	2,057,215	122,194	5·16	630,099
1954/55	261,242	8·74	2,283,115	102,817	4·39	451,805
1955/56	260,726	11·17	2,911,621	81,783	6·40	523,176
1956/57	296,968	11·23	3,340,518	74,094	5·89	436,503

The final figures for 1957-58 are not yet available. These figures illustrate the value of the hybrid varieties to Southern Rhodesia and also the steady increase in the acreage planted to hybrids and the corresponding decrease in the acreage sown to open-pollinated varieties. Although a number of hybrids have been available to farmers over this period of eight seasons, they have all been rather similar in type and breeding and all approximately ten to fourteen days earlier maturing than Hickory King. Also they have lacked resistance to the leaf blight, *Helminthosporium turcicum*. Within the next two or three years these hybrids are likely to be superceded by a new and wider range of varieties which will vary in the time they take to mature and which will all have improved resistance to Helminthosporium. It is expected that having a choice of early and late maturing hybrids will be of considerable benefit, and it is not improbable that during the next cycle of eight years the superiority of hybrids over open-pollinated varieties will become even more marked.

On the station the season proved most unsuitable for carrying out maize yield trials. The late start and early ending of the rains meant that the yields obtained were as much an indication of early maturity as of potential yielding ability. This was particularly disappointing because the trials included for the first time a number of new double hybrids, all of which are potential commercial varieties. In spite of the season, a number of the late maturing hybrids yielded well and promised that, under favourable conditions, they will be better than S.R. hybrids No. 1 and 8.

Male-sterile seed of four inbred lines, two of which are N3-1-4-9 and N3-2-3-3, was given a first bulking. As N3-2-3-3 is now the inbred seed parent of the single cross most widely used as seed parent in making commercial double hybrids, male-sterile seed can quickly be made available to members of the Seed Maize Association if and when they require it.

Staff limitations have prevented the development of a yellow hybrid breeding programme. A small nursery is being maintained but it is quite inadequate. No attempt has been made so far to test these yellow lines for combining ability. If yellow hybrids are required, obviously they should be developed in one of the higher rainfall areas in order to ensure that they are adapted to the conditions pertaining in those areas where they are eventually to be grown on the widest scale. The present intention is to extend the programme as soon as a plant breeder is appointed.

APPLICATIONS OF NITROGENOUS FERTILIZERS TO MAIZE

Nitrogen Treatments

A) Forms: 1, Sulphate of Ammonia; 2, Urea; 3, Ammonium Nitrate.

B) Levels: 1, Nil; 2, 33⅓ lb. N p.a.; 3, 66⅔ N p.a.; 4, 100 lb. N p.a.

C) Times of Application: 1, All at planting; 2, all top-dressed six weeks after planting; 3, half at planting and half top-dressed six weeks later.

All plots are split for method of application of nitrogen to allow broadcasting to be compared with placing.

YIELDS OF GRAIN (IN BAGS OF 200 LB. PER ACRE)

Nitrogen Level	Time of Application			Mean
	P	T–D	P+T–D	
0 N	—	—	—	18·18
33⅓ lb. N	24·77	23·87	24·51	24·38
66⅔ lb. N	30·77	25·97	29·56	28·77
100 lb. N	30·23	28·24	29·64	29·37
Mean	28·59	26·03	27·90	—

L.S.D. (P = ·05) Control v. Marginal/Means = 1·76 B.P.A.
Marginal Means = 1·25 B.P.A.

Responses to the amounts of nitrogen applied, and the time of application of the nitrogen, were highly significant. The main effects of the form in which the nitrogen was applied, and the method of application (broadcasting versus placing), were not significant, but there were significant interactions between the levels of nitrogen, the form of nitrogen and the method of application and also between the levels of nitrogen, the time of application and the method of application.

As in previous years this trial was carried out on the second successive crop of maize after a leguminous green manure, the stover from the first crop of maize having been removed. The response to nitrogen was high and economically very remunerative. From the table of yields it will be seen that, this season, the response to the nitrogen was greatest when applied at planting. Although there is no significance in the body of the table, certain trends are indicated. The maximum yield was obtained from 66⅔ lb. of N (approximately 317 lb. Sulphate of Ammonia)

applied at planting. In contrast, when the nitrogen was applied as a top-dressing six weeks after planting, the yield from 100 lb. of N was greater than that from 66⅔ lb. N, although still not as high as the yield from 66⅔ lb. N given at planting.

Whilst this year the application of all the nitrogen at planting has proved more beneficial than top-dressing all or part of it six weeks later, it should be remembered that in some seasons this has not been the case. Obviously seasonal conditions, and the nitrogen status of the soil at planting, can have an important bearing on the timing of the application of the nitrogen.

RESIDUAL EFFECT OF APPLICATIONS OF NITROGENOUS FERTILIZERS TO MAIZE

Object. This trial was laid down to measure the residual effect of nitrogen applied to maize the previous season. This is the first year of the trial which will be conducted annually on the plots used for the main nitrogen trial the previous season. A further crop of maize is being used to measure the residual effect.

Fertilizer Treatment 1957-58. A basic dressing of 260 lb. Nitrate of Soda to all plots. No phosphates or potash.

Nitrogen Treatments 1956-57.

A=No nitrogen.
B= 50 lb. N at six weeks after planting.
C=100 lb. N at six weeks after planting.
D=250 lb. N at planting.
E=500 lb. N at planting.
F=250 lb. N at planting + 250 lb. N at six weeks after planting.

YIELDS OF GRAIN (IN BAGS OF 200 LB. PER ACRE)

Season	Nitrogen Treatments 1956/57						Mean
	A	B	C	D	E	F	
1956/57	12·97	20·63	25·10	22·17	24·52	26·59	22·00
1957/58	18·15	16·55	16·09	15·07	15·58	15·46	16·15

L.S.D. (P = ·05) = 2·01 B.P.A. (1957/58).

As the 1957-58 maize crop was the third in succession, it was considered desirable to give a basic dressing of nitrogen to all plots, but that the application should not be large enough to mask any residual effect there might be of the previous year's application. It will be seen that in 1957-58 the yield from treatment A, which received no nitrogen in 1956-57, was significantly higher than that from any of the other treatments except B, all of which received at least 100 lb. N in 1956-57.

It will be most interesting to see if a similar result is obtained in the 1958-59 trials.

POTATOES

Programme. Priority has been given to the introduction and testing of varieties. The variety trials at this station form part of a regional trial programme designed to test the suitability of varieties to a wide range of conditions found in Rhodesia. Studies have been continued on the many agronomic factors affecting potato cultivation such as seed rate, fertilizer usage, disease control, etc.

A series of demonstration plots laid down to exhibit variety identification features and virus disease symptoms proved informative and popular with visitors.

1. Varieties

Variety yield trials at this and other stations indicated that Robijn, Gineke and Pimpernel are reliable late blight resistant varieties for summer planting. This conclusion takes into account results obtained in previous years.

In registration trials the varieties Walanga and Loman 43 - 35 have shown promise as high yielding blight resistant varieties, while Ulster Prince is a potentially useful early maturing variety.

In introduction plots, the varieties Ackersegen, Engelum D.D. 1133 (now called Dekama), Surprise, Wilpo and the seedlings R 571/1 and R 639/33, performed sufficiently well to merit further trial.

2. Other Agronomic Experiments

(a) *Fertilizer Trial.* Responses were obtained to phosphate, nitrogen and kraal manure applications. There were indications that there might be a response to potash at high levels of nitrogen application.

(b) *Seed Rate Experiment.* Yields were influenced by seed rate (in terms of weight of seed planted per acre), although there were indications that increased yields obtained by applying high seed rates might not cover the extra costs involved.

(c) *Mulching and Ridging.* An experiment to determine the effects of reducing soil temperatures and moisture loss by mulching, and growing the crop "on the flat" instead of ridging, showed no significant effects due to any of the treatments. It was felt that this was largely due to the prolonged rainy and overcast weather.

(d) *Transplanting Experiment.* A method of propagating, by raising plants from individual sprouts in soil cubes and subsequent transplanting to the field, showed great promise as a rapid method of bulking up new varieties.

All the above experiments are to be repeated.

WHEAT

Two crops of wheat were planted during the season under review. It was late in the season when stem rust made its appearance; and, for selection purposes in the breeding nurseries, it was necessary to take plants from the introduction plots to start a field epidemic. In many cases lodging appeared to be limiting yields and more attention will be paid to the development of types with a short, strong straw.

The policy in the breeding programme has been twofold. First a wide range of introductions from all over the world have been grown in observation plots and selections made from those which appeared to be best suited to Rhodesian conditions. In a few cases seed of these selections has been bulked and made available to farmers who wish to try new varieties. Secondly, an extensive crossing programme has been carried out with the object of developing new varieties which will be still better suited to local conditions than any of the introduced varieties or varieties at present being grown locally. The earliest of these crosses were in the F5 and F6 segregating generations when sown this winter. Some of them have reached the final stages of selection and will soon be ready to bulk for testing in replicated yield trials.

At the time of writing this report the final results of the winter trials are not yet available. Harvesting and threshing are still in progress. At present there is every indication that the winter crop will realize considerably higher yields than those obtained in 1957. The wheat followed soya beans ploughed under as green manure in March. Phosphates and potash were applied to the soya beans and the only fertilizer given direct to the wheat was a dressing of nitrate of soda when the wheat was approximately five weeks old. (A uniformity trial with the selection F 84A 6 from the Australian variety Gabo has yielded at the rate of 18.7 bags per acre.)

Almost two hundred artificial pollinations were carried out during the season. An American introduction, "Yaktana", obtained both from the International Rust Nursery and direct from Mexico, has shown much promise and has been used as one of the parents in many of the new hybrids.

HORTICULTURE

This was a year of continued expansion in the horticultural industry. Fruit and vegetable production increased in most areas, both for fresh consumption and for processing at the Umtali, Cashel and Chipinga factories.

Much scope remains, however, for extended production and a greater measure of self-sufficiency, particularly in regard to summer vegetables grown during heavy rains, and all kinds of tree fruits, including bananas and deciduous kinds.

CLIMATIC CONDITIONS

Delayed rains and continuance of hot dry weather until December damaged developing citrus fruit and resulted in decreased yields. These conditions were followed in January by heavy rain and practically no sun for ten weeks, which seriously upset vegetable growing. Little hail occurred, which caused no serious damage. While the winter was not severe, the cold weather was prolonged and delayed spring plantings of tender varieties of vegetables.

CITRUS

After the heavy cropping in 1957, it was to be expected that orange yields would be much reduced in the current year, due to the biennial bearing behaviour of trees. Much shedding of small fruit occurred due to excessive transpiration in November.

The home demand for oranges and naartjies continued to increase and there were no marketing problems. Rhodesian grown nursery trees were in good supply and were of high quality. Zinc and manganese deficiency diseases were still common in bearing trees of smaller growers, but responded well to foliar applications of these elements.

The first plantings of citrus trees at the Hippo Valley Estate have grown well. A few trees will begin bearing fruit in the coming year.

Production. Sales of Southern Rhodesian citrus for 1956-57, including fruit used for processing by the Mazoe Citrus Estate, were:—

	Short tons	*Value*
Orange	12,135	£165,447
Lemon	741	8,640
Grape-fruit	172	3,340
Other	304	8,022
TOTAL	13,352	£185,449

Last year 11,437 tons.

Citrus Trees. The declared number of citrus trees in Southern Rhodesia for 1956-57 was:—

	Bearing	*Not bearing size*	*Total*
Orange	144,224	131,232	275,456
Lemon	17,893	9,713	27,606
Grape-fruit	7,155	2,924	10,079
Other	9,448	7,669	17,117
TOTAL	178,720	151,538	330,258

This represents a total increase for the year of 24,500 trees.

SUB-TROPICAL FRUIT

Extended plantings were on too small a scale to meet our additional fruit requirements. The adoption of standard-size containers would be an incentive to buyers.

Bananas. With a recorded acreage of 289, growers were not keen to plant more bananas until quantitative import control of the fruit from Portuguese East Africa can be effected. Meanwhile Federal imports of Cavendish fruit have soared to over a quarter million pounds value this year. Two small trial plantings were established at Shamva. Six plants of the Gros Michel variety were introduced from Kew Gardens for trial in the Sabi Valley. The trial consignment of fruit from Nyasaland for Salisbury proved unsuccessful due to delay and high transport charges. A fertilizer experiment was laid down for two Burma Valley farms.

Pineapples. With 105 acres established, more interest was shown in this crop. Excellent quality Queen variety fruit from Chipinga was marketed in Salisbury. Fruit travelled well when picked slightly immature, and sold readily.

Papaws. Bearing size trees increased by over 7,000 to 26,000. Most fruit was marketed loose or in large returnable crates. Prolonged winter cold appeared to be responsible for the increased outbreaks of fruit rot disease.

Avocados. More locally raised budded trees were available from Umtali and more plantings were made. Fruit crops were good.

Sub-tropical Fruit Trees (excluding citrus). For 1956-57 the recorded total of trees in Southern Rhodesia was:—

	Bearing	*Not bearing size*	*Total*
Papaw	26,363	13,491	39,854
Mango	13,666	5,928	19,594
Avocado	3,735	5,185	8,920
Guava	14,059	5,626	19,685
Other	7,746	4,946	12,692
TOTAL	65,569	35,176	100,745

Last year's total was 89,365.

COFFEE

The visit of the Kenya Government coffee expert to the Eastern Districts was of great benefit to this new industry. Seventy-seven acres of coffee are now planted, and further expansion is considered well justified in the Eastern Districts.

DECIDUOUS FRUIT

While frost incidence was light, the long spell of low winter temperatures was beneficial to fruit trees to give them a proper resting period. Additional plantings were made.

Plum crops were moderate, peaches fair, while apples yielded heavier crops than for several years. Co-operative marketing of Eastern Districts fruit through a Salisbury Agent was effected. Higher standards of grading and packing, with improved distribution, were required. The necessary steps to secure these standards have been taken.

Fruit sucking moth attacks were still a problem, especially with apples and canning peaches. Bitter rot disease (Glomerella) of apples was more common at Melsetter than at Inyanga. Some spraying was carried out with moderate success.

Grapes. Considerable interest was displayed in the growing of grapes for table and wine purposes and there were numerous enquiries from prospective growers. Many new plantings were made. Early varieties are still considered to be the most satisfactory.

Deciduous Fruit Trees. Southern Rhodesia recorded totals for 1956-57 were:—

	Bearing	*Not bearing size*	*Total*
Apple	32,792	38,333	71,125
Peach	32,420	21,946	54,366
Plum	11,688	7,377	19,065
Pear	2,653	3,622	6,275
Apricot	2,936	3,469	6,405
Other	9,600	20,068	29,668
TOTAL	92,089	94,815	186,904

Last year's total was 176,420.

FRUIT IMPORTATION

Apart from a decrease in citrus imports, other kinds of fruit showed a considerable increase and an all-time record. Far greater home production is possible as suitable land and irrigation become available. The values of Federal imports for 1957 were:—

Deciduous Fruit Trees	£275,675
Bananas	276,151
Grapes and Other Miscellaneous	92,206
Citrus	13,962
Other Sub-tropical	48,298
TOTAL	£706,292

For last year the total value was £494,986.

VEGETABLES

In 1956-57 a total of 4,700 acres of fresh vegetables were grown. Higher yields were obtained through improved management. Crops were readily marketed. Heavy and consistent rains during January and February were responsible for many crop losses and successional cropping delays. Heavy importations of vegetables for both Salisbury and Bulawayo were necessary. Raised beds and ridge planting are effective means to improved summer cropping.

More growers are carrying out routine spraying for pest and disease control while boron and molybdenum applications have become standard practice to prevent deficiency diseases in beet and cauliflower respectively. Frost caused some crop losses of peas for canning in the Eastern districts.

Fresh Vegetable Imports.—For the Federation in 1957 these were 2,539 tons, valued at £72,816.

Onions.—For 1956-57 the Southern Rhodesia onion acreage increased by 100 to 383 with a yield of 26,677 bags. We are now catching up with in-season requirements. Importation is still high for the rest of the year, and for 1957, 43,000 bags were brought into the Federation.

SEED GROWING

This young industry has got away to an excellent start in the production of vegetable and flower seed growing for export. Membership of the Association now totals about 60.

NURSERY PLANTS AND FLOWERS

No estimate of local nursery production is possible but additional scope remaining is shown by the 1957 importation of planting material valued at £64,200 and cut flowers £15,200.

MISCELLANEOUS

Advisory Services.—Throughout the year specialist visits were made to growers in the main production areas. Requests for visits were considerable. Until a more adequate service can be provided, the horticultural industry will be considerably retarded.

Horticultural surveys were carried out at the Abercorn, Que Que, Selukwe and Inyanga areas and reports submitted. Numerous talks and demonstrations were given at various Farmers' and I.C.A. Associations and horticultural meetings. Six lectures on fruit and vegetable growing and marketing were given to senior students at the Gwebi Agricultural College. The Horticultural Branch was represented on various committees.

AGRICULTURAL SHOWS

Judging of fruit, vegetables and flowers was carried out by the Senior Horticulturalist at agricultural and/or horticultural shows at Beatrice, Bindura, Sinoia, Salisbury, Gatooma, Gwelo, Bulawayo, Rusape and Umvukwes. A fruit production educational exhibit was staged at the Salisbury Agricultural Show.

RHODES INYANGA ORCHARDS

Rainfall for the year was 52.66 inches. There were 45 ground frosts recorded, the lowest temperature being 15.1 degrees Fahrenheit.

Fruit Crop and Sales.—Yields of apples were heavier than for some years, this being general throughout the district. Pear and plum crops were fair to light. Gross returns from fruit sales were £1,721 of which apples realised £1,486. Apart from small local sales, and a lesser quantity to the Farmers' Co-operative, the bulk of the crop was marketed through the Inyanga Fruit Growers' Association. Harvesting and getting the fruit dry for packing was difficult during January and February owing to heavy and incessant rains experienced.

RESEARCH WORK AND EXPERIMENTS

As this concerns tree fruit growing, the experimental work involved is of a long-term nature.

Apple Nutrition.—Nitroline applications, with and without magnesium, to trees of five apple varieties showing deficiencies gave inconclusive results. As the experiment is entering its third year, full effects of treatments should soon be apparent.

A straight magnesium soil versus foliar application experiment gave a response in the White Winter Permain variety, but not with Ohenimuri. No potash fertilizer has been given in order to avoid magnesium uptake effect.

Apple leaf analyses carried out by the Chemistry Branch proved the low content of magnesium present. Further material for comparison will be submitted later.

Soil Management.—Studies of permanent sod with mowing as against normal cover crops and mowing, then autumn cultivation, gave varied results without being clearly defined. Various observations were recorded.

Dalapon spraying in November proved most effective in killing Kikuyu grass between apple trees with no damage to them.

Irrigation.—Spring irrigation of cling peaches and apples showed marked improvement of peach cropping. Fruits on the average were 3.1oz. with controls 2.6 oz. Tree crops yields were increased from 88 lb. to 141 lb. Apple tree behaviour showed little effect. This work is being repeated.

A new apple variety planting outside the windbreaks was made for investigations on the effects of irrigation and climatic conditions.

Trials and Recording.—Variety trials of deciduous fruits were continued, clover cover cropping, mulching, pruning and shoot growth measurements, blossom and pollination studies and yield recording, cider making, climatic influence on fruit trees, pest and disease incidence, formed part of the more important work done.

MISCELLANEOUS

A successful field day was held at Rhodes Inyanga Orchards in February which was attended by the Minister and Acting Secretary; altogether about 100 people attended.

Advisory visits were paid by the Orchards Staff to local fruit growers. Numerous visitors called for technical information. The Horticulturist prepared three articles for publication.

BRANCH OF ENTOMOLOGY

INTRODUCTION

J. A. WHELLAN
CHIEF ENTOMOLOGIST

Steady progress has again been made in Entomological matters in the Federation. The Branch carried a vacancy for most of the year due to the resignation of Mr. H. D. Brown until this was filled by the appointment of Mr. A. J. Carnegie. Furthermore the cotton research team based on Gatooma was strengthened by the appointment of Mr. Matthews. Some help with local entomological problems other than those directly concerned with cotton pests has been given by this team. This particularly applies to an investigation of the biology of cutworms, a heavy infestation of which, promising to lend itself well to this kind of investigation, has been found within easy reach of the Gatooma Research Station.

The increased interest being taken in castor beans as a cash crop drew attention to the many insect pests to which this crop is susceptible. In some cases very serious damage was caused and yields were consequently much less than anticipated.

Good progress was made with the helminthological survey of Rhodesia and a little information has been obtained in respect of Nyasaland. Much of this information has been obtained because of the ready co-operation of officers of the Northern Rhodesia Department of Agriculture, the department of Conservation and Extension and the Southern Rhodesia Department of Native Agriculture as well as of members of the farming community. More attention was paid to the dangers of spreading eelworm infestation by means of infested nursery stock and because of heavy infestations two nurseries were placed in quarantine.

Towards the end of the period the Plant Pests and Diseases Act, 1958 was passed by the Federal Government. All regulations and orders dependent on this Act have now been prepared and their publication is unlikely to be much further delayed. Uniformity in the treatment of most phytosanitary matters, particularly in relation to plant imports, will then have been achieved throughout the Federation.

Complete inspection of tobacco premises in Northern and Southern Rhodesia was again achieved. The policy of inspecting town warehouses and similar premises several times annually was continued.

The International Red Locust Control Service has again had a successful year despite the resignation of several of its more experienced professional staff. Locust numbers, are, however, expected to be higher in the coming season though they are unlikely to be dangerously so.

A satisfactory year's working has also been reported by the African Migratory Locust Control Organization. The Federation was represented at its Annual Council Meeting in Paris by the Scientific Liaison Officer in London, Mr. J. E. C. Coventry.

RESEARCH AND INVESTIGATION

The establishment of ley pastures at Grasslands Research Station has been greatly hampered by the activities of white grubs. In many cases the infestation has covered considerable areas and resulted in the complete destruction of the pastures. The tufts of grass show evident signs of reduced vigour and in many cases they can be lifted bodily from the ground, when as many as a dozen large white grubs are to be found feeding at the roots. This problem poses special difficulties. The crop is not of high financial value. The same plants need protection for a period of several years. It does not appear practical to apply insecticides from above once the grass has covered the ground. Therefore an application of a very persistent insecticide to the ground before the grass is planted seems to offer the best chance of success. Two insecticides were chosen for trial, dieldrin and DDT and each is being tested at three levels, dieldrin at one, two and four pounds per acre, and DDT at two, four and eight pounds per acre. Towards the end of the first year both insecticides at all the levels of application appeared to give some control estimated both by the growth of the grass and the number of white grubs present and dieldrin seemed to be considerably more effective than DDT. It is, as yet, too early however to subject the results to statistical analysis or to judge the effect of the treatments as a long-term means of control.

Some observations have also been made on the biology of these insects. Although several species may be concerned the principal pest at Grasslands is undoubtedly *Eulepida mashona* Arrow. The adult beetles feed on the foliage of various indigenous trees which are numerous in the country surrounding the station. The principal ones are Msasa (*Brachystegia spiciformis),* M'hacha *(Parinari mobola)* and Mnondo *(Isoberlinia globiflora).* The beetles lay their eggs in the ground early in the rains and the larvae become full grown soon after the end of the rains. They remain quiescent during winter and pupate in spring the adults emerging with the rains.

A heavy infestation of cutworms was reported on a farm near Gatooma under circumstances which seemed to lend themselves to a thorough investigation. In the mid dry season all sizes could be found on fallow land from which a maize crop had been removed. Later, in mid-August, the numbers present in the top six inches of soil had greatly decreased. Whether this was due to movement laterally or vertically, to dying out due to starvation or to the attacks of predators is not yet known. At the same time where irrigation was carried out and food in the form of crops or weeds was present, it was found that continuous development could occur through the winter. More than one species appears to be involved but this side of the question has not yet been resolved. The occurrence of cutworms seems to be unpredictable and it is therefore generally difficult to arrange an investigation. The present one, which is continuing, may well give valuable information since much of what is commonly regarded as "known" about cutworms seems to be based on very little scientific evidence and often merely on analogy with what happens in other countries where the climate and even the species concerned may be quite different.

Study of the leaf eating ladybirds has continued. Preliminary observations were made on the habits of *Epilachna canina* on potatoes and *E. chrysomelina* on cucurbits. The maize ladybird, *E. hirta* was not much in evidence this year and little damage due to its activities was reported.

The preliminary work on the life history of the maize stem-borer under Southern Rhodesian conditions was completed, and a paper on this has been prepared by C. N. Smithers and submitted for publication in the Bulletin of Entomological Research.

Considerable attention was given to castor beans being grown in various parts of the country. A great many insects seem to attack this crop and the work has so far proceeded little beyond the survey stage. Control measures recommended can, as yet, be only tentative since there has been no opportunity for proper trials. The most important pest seems to be a mirid bug, *Eurystylus capensis.* By piercing and sucking the tissues of the leaves and candles this insect causes distortion and stunting of their growth. The other principal pests are all lepidopterous. One of these, *Achaea* sp. may be of importance in another direction since it is a fruit-piercing moth. The larvae were often quite numerous on castor beans but, being leaf feeders, might not do a great deal of damage to older plants. The American bollworm, *Heliothis armigera,* was occasionally found attacking the capsules when it would, of course, cause their abortion, and the larvae of *Prodenia litura* occasionally caused similar damage.

Some observations on insects attacking lucerne were commenced but have yielded little result due to difficulties experienced in maintaining the experimental lucerne crop.

The research programme on eelworms made good progress. The experiment to test the longevity of *Meloidogyne javanica* in various soil types in the absence of host plants is now in progress and the first results of interest should be forthcoming in the course of the next year.

Four concrete lined pits have been built in each of which a heavy infestation of a pure line of each of the *Meloidogne* spp. known in the Federation will be built up for the purpose of testing the susceptibility of various plants of economic importance to the Federation.

STORED PRODUCT INSECTS

Close liaison has been maintained throughout the year with the Grain Marketing Board, and an entomologist of the Branch has been attached to the board to advise on and supervise pest control matters.

"Phostoxin" was used extensively at the Aspindale Silo and it has virtually cleared the infestation in the silo. Maize treated with "Phostoxin" has been stored for periods of up to seven months and has remained free of infestation. There

has as yet been no case of breakdown in the protection given. Many of the bins at the Silo have been repaired and methyl bromide, which is of course much cheaper than phostoxin, has been successfully used on four of these. A new circulation plant for methyl bromide is in course of construction and should come into use early next year.

Besides several occurrences of cigarette beetle in the normal way in cured tobacco there were two occurrences of this insect in stored groundnuts, one in imported grevillea seeds from Australia and one in tobacco seed which had been stored for planting. The last was a particularly heavy infestation.

OCCURRENCE OF PESTS

There were again no major outbreaks of pests during the year. Reports of the occurence of army worm were very few and none of them was confirmed. The very similar lawn caterpillar *Spodoptera* spp. was reported a number of times at the beginning of the dry season.

Several mites were recorded causing damage. These mostly await specific determination. Eriophyid mites caused deformation of the shoots of lawn grasses and of the leaves and flowers of *Aloe* spp. The grey mite, now known to be the causative organism of concentric ring blotch of citrus proves to be very widespread, at all events in Southern Rhodesia, and the pear bud mite (pear leaf blister mite) was found in the course of a visit to the Rhodes Inyanga Orchards. Red spider mites were found on various shade plants at Salisbury and on tomatoes and beans in the Eastern districts as well as at Salisbury.

Several reports of damage due to thrips were received. The most serious of these concerned an attack on barley and oats on the Kafue polder where it caused blindness of the ears over considerable areas. The same species was found damaging lucerne and another one on weeping love grass grown for seed. Onion thrips proved to be widespread and in some cases caused considerable damage. It was readilly controlled by sprays containing DDT. Peas at Henderson Research Station were heavily attacked by another species and obvious damage was caused.

Serious damage to the seed heads of weeping love grass was also caused by a lygaeid bug. Aphid damage to wheat was reported as very serious in the Union of South Africa but the species responsible has been found in Rhodesia only on the Salisbury Experiment Station so far. Irrigated barley in the Fort Victoria area was, however, severely damaged by another species, the maize aphis, while young barley plants at Henderson Research Station were also attacked.

Lucerne at Henderson Research Station and Salisbury carried a large insect population. While as usual the Clouded Yellow Butterfly was the most conspicuous and probably caused most damage, leaf hoppers and aphids were also very numerous. Peas of the second irrigated crop at Henderson were moderately attacked by aphids. Apple trees in isolated orchards in the Inyanga and Melsetter districts which showed infestation by woolly aphis were examined. Though the attack was quite severe it appeared to be localized and the economic significance of this insect in Rhodesia is not at all clear at present.

Cabbage and related plants were commonly attacked with varying severity during the dry season by cabbage aphis and diamond back moth. Flea beetle often was troublesome amongst seedlings. Once again there were few reports of Bagrada bug.

ADVISORY SERVICE

Enquiries recorded at the Branch numbered 512. The increase over last year (355) is in large measure accounted for by the considerably increased number of helminthological enquiries which are being received now that the appointment of the helminthologist is generally known.

Advisory tours were restricted because of the lack of milage available, and most practical advisory work was perforce carried out in the Salisbury area. One entomological tour was made in the Eastern districts and a helminthological tour through Bulawayo and Livingstone and Lusaka. Some other visits were made to the eastern districts when it was possible to share transport with other Government officials, and this was also done in respect of an entomological investigation carried out in the Chimanda Native Reserve in conjunction with the Rhodesian Schools Exploration Society. A course of eight lectures, including one specialist helminthological lecture, was given to students at Gwebi Agricultural College. An exhibit was staged at the Salisbury Agricultural Show which drew attention particularly to the damage caused by chewing and sucking insects and by eelworms.

PHYTOSANITARY SERVICES

The third meeting of the Interafrican Phytosanitary Commission, held in London in September, 1958, was attended by the Chief Entomologist. Questions of particular importance to the Federation which were discussed were concerned with the importation of tea and tobacco seeds, of grape vine plants and of rosaceous plants, including deciduous fruits and fruit trees. Considerable attention was given to the necessity for establishing adequate quarantine facilities both in Europe and Africa and it is apparent that the development of certain crops will be hampered unless quarantine facilities are made available in the Federation soon. This meeting was preceded in April by a meeting of specialists held in Nairobi also attended by the Chief Entomologist in the course of which the quarantine facilities available at Muguga were examined.

The Plant Pests and Diseases Act was passed during the year. Its main object is to unify the legislation in regard to plant imports throughout the Federation and in regard to other phytosanitary matters in the two Rhodesias. At the same time the old legislation has been brought up to date and into line with the requirements of the Interafrican Phytosaintary Commission. All regulations necessary under the Act have been prepared and their publication is now dependent only on the agreement of the northern territories.

Fruit imported from the Union of South Africa was generally of good quality and very little codlin moth infestation was found. In the majority of cases where infestation did occur the degree was low enough to allow the fruit to be sorted and released. Citrus fruit from provinces of the Union where black spot occurs was intercepted at Bulawayo on 662 occasions, mostly in small quantities brought with passengers. Five consignments of water hyacinth were intercepted and destroyed at Bulawayo.

Special permits for the importation of plants totalled 722 and Annual Permits for the import of their stock were issued to 56 nurseries in the Union of South Africa.

Registered nurseries in Southern Rhodesia totalled 54. Most of them were inspected during the year. Because of heavy infestations of root-knot nematodes it was necessary to quarantine two of them. Phytosanitary certificates were issued in respect of 199 consignments of plants for export.

The total of Tobacco Removal Licenses issued was 4,471, of these 984 premises were in African areas and not subject to inspection. In Northern Rhodesia inspections of a further 307 premises were carried out. The total number of inspections made was 4,454 and again all European owned premises were inspected at least once. The policy of inspecting Salisbury warehouses and similar premises was continued and most of these were inspected four times.

Two inspections were made of the railway storage sheds at Beira. Five consignments of tobacco infested with cigarette beetle were found during the March inspection. In some cases the tobacco had arrived in Beira within the preceding few days so that it had evidently been infested before despatch. Eight occurrences of cigarette beetle were examined in Salisbury warehouses and similar premises and one in an outside warehouse. No occurrences on farms came to our knowledge. Legal action was successfully taken against two farmers who had failed to destroy unwanted tobacco by the authorized date. A considerable number of minor infringements of the Tobacco Pest Prevention Regulations was also found but remedial action was taken without the need for prosecution.

PUBLICATIONS

The following articles have been published:—

(a) In the *Rhodesia Agricultural Journal*

1. The use of insecticides for the control of farm and garden pests by J. A. Whellan.
2. The Black Citrus Aphid by C. E. Taylor.
3. Report of the Chief Entomologist for the year ending 30th September, 1956, by J. A. Whellan.

(b) In the *Entomologist's Monthly Magazine*

Nomenclature of the Potato Aphid by C. E. Taylor.

(c) In *Nematologica*

Effect of osmotic concentration on hatching of some plant parasitic nematodes by G. C. Martin.

THE DAIRY INDUSTRY

R. G. JONES
CHIEF DAIRY OFFICER

DAIRYING SEASON

Although considerable difficulties were encountered in most areas in getting crops established during this season due to the late onset of rains, the season from a milk production point of view was another good one and total milk production continued to increase rapidly. There is no doubt that improved methods of management and feeding of dairy herds are reducing the effects of seasons on milk production but as economic milk production must depend on the production of food on farms, poor seasons will always have an effect on milk production which could be very serious if a series of droughts were encountered.

PRODUCTION OF DAIRY PRODUCE

Total milk production has continued its upward trend and an extraordinary increase in milk production in Northern Rhodesia is evident in the dry season when monthly intake by the Co-operative Creameries of Northern Rhodesia is some months exceeded monthly intake during the previous flush season. The reason for this is not clear but dairying is assuming an increasing importance in the agricultural production of that territory. Preliminary figures indicate that there was an overall increase in milk production of about 1½ million gallons of which about 1¼ million gallons was accounted for by increased production in Southern Rhodesia.

Milk supplies surplus to whole milk requirements received by the Dairy Marketing Board in Southern Rhodesia and by the Co-operative Creameries in Northern Rhodesia was mainly used for the manufacture of cheese but during this year a significant quantity has been used for the manufacture of skim milk powder in Southern Rhodesia and in both territories an increasing amount of skim milk either sweet or sour has been sold to Africans in urban areas. Production of sterilized whole milk and flavoured skim milk has been started in both territories. In Northern Rhodesia a substantial amount of milk has been utilized in this way but in Southern Rhodesia, due to a later start, only comparatively small quantities of these sterilized products had been produced by the end of September.

Table I gives the production figures for the main commodities in Southern Rhodesia over a number of years and Table II gives similar figures for Northern Rhodesia for the last two years.

TABLE I

DAIRY PRODUCTION, 1920-1958 — SOUTHERN RHODESIA

Year	Butter 1,000 lb.	Cheese 1,000 lb.	Liquid Milk (*a*) 1,000 galls.	Total Gallons
1920	600	79	258	2,000,000
1930	1,768	163	1,008	6,100,000
1940	1,686	383	2,095	6,910,000
1945	1,224	702	3,848	7,750,000
1950	900	394	5,720	9,000,000
1954/55	1,096	1,267	7,632	12,514,000
1955/56	1,083	2,168	8,050	13,202,000
1956/57	1,387	2,050	9,100	14,900,000
1957/58 (*b*)	1,441	2,240	10,103	16,194,000

(*a*) Milk available for use as fresh milk, fresh cream and ice cream;
(*b*) Preliminary figures.

TABLE II

DAIRY PRODUCTION, 1956-1958 — NORTHERN RHODESIA

Year	Butter 1,000 lb.	Cheese 1,000 lb.	Liquid Milk (*a*) 1,000 galls.	Total Gallons
1956/57	40	497	1,750	2,400,000
1957/58 (*b*)	56	426	1,827	2,566,000

(*a*) Milk available for use as fresh milk, fresh cream and ice cream;
(*b*) Preliminary figures.

The Dairy Marketing Board in Southern Rhodesia and the Co-operative Creameries in Northern Rhodesia are the main purchasers of milk in the two territories. There are certain other small purchasers of milk in areas outside the scope of these organizations such as the Gazaland Co-operative Cheese Factory in Chipinga and the Zambezi Co-operative Dairies in Livingstone but these organizations handle a very small quantity of milk in comparison with the Dairy Marketing Board and the Co-operative Creameries of Northern Rhodesia. It follows, therefore, that the main growth of the industry is reflected in the operations of these two main organizations and Tables III and IV which show the approximate number of suppliers and the total intake of these organizations during recent years illustrate the expansion of milk production.

TABLE III

THE DAIRY MARKETING BOARD (SOUTHERN RHODESIA)

Year	Number of Suppliers (August)	Total Milk Supplied (Gallons)
1952/53	280	5,638,000
1953/54	322	6,488,000
1954/55	364	7,817,000
1955/56	403	8,852,000
1956/57	416	9,736,000
1957/58	459	10,794,000

TABLE IV

THE CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

Year	Number of Suppliers (August)	Total Milk Supplied (Gallons)
1955/56	118	1,431,000
1956/57	125	1,880,000
1957/58	121	2,211,000

It is interesting to note that the average production per supplier is still increasing.

CREAMERIES, BUTTER PRODUCTION AND CONSUMPTION

There has been no increase in the number of registered creameries and all butter manufacture and importation has been done by these creameries situated at Lusaka, Salisbury, Gwelo and Umtali. It will be observed from Tables I and II that butter production has increased in recent years. This has been almost entirely due to an increased quantity of milk supplied to the Dairy Marketing Board and the Co-operative Creameries of Northern Rhodesia which was surplus to whole milk requirements and which was separated for the sale of skim milk and the production of skim milk powder. The actual delivery of butterfat direct from producers has remained substantially the same for the past few years and is equivalent to just over 1,000,000 lb. of butter per annum. The indications are that any appreciable increase in butter production in both Northern and Southern Rhodesia will derive from the surplus pool of these organizations rather than from direct deliveries of butterfat from producers under present conditions.

Apparent consumption of butter over recent years are given in Tables V and VI for Southern and Northern Rhodesia respectively.

TABLE V

APPARENT CONSUMPTION OF BUTTER — SOUTHERN RHODESIA

Year	*Production* 1,000 *lb.*	*Consumption* 1,000 *lb.*	*Shortfall* 1,000 *lb.*
1950/51	767	2,643	1,876
1951/52	975	3,062	2,087
1952/53	964	3,207	2,243
1953/54	906	3,232	2,326
1954/55	1,096	3,482	2,386
1955/56	1,083	3,650	2,567
1956/57	1,398	3,997	2,599
1957/58 (*a*)	1,449	3,805	2,356

(*a*) Preliminary.

TABLE VI

APPARENT CONSUMPTION OF BUTTER — NORTHERN RHODESIA

Year	*Production* 1,000 *lb.*	*Consumption* 1,000 *lb.*	*Shortfall* 1,000 *lb.*
1956/57	44	1,678	1,634
1957/58 (*a*)	58	1,525	1,467

(*a*) Preliminary.

It will be observed that there has been an apparent fall in the consumption of butter and it is suggested that this can be attributed to the increased consumption of margarine—particularly margarine containing 10 per cent. butter which has been imported.

The shortfall was made up by importation from New Zealand, Kenya and South Africa in the following overall proportions:—

New Zealand	4·1 per cent.
Kenya	39·2 per cent.
South Africa	56·7 per cent.

Producer prices for butterfat remained unaltered as follows:—

Southern Rhodesia	*First Grade Cream*	*Second Grade Cream*
January to March	3s. 0d. per lb.	2s. 9d. per lb.
April and December	3s. 10d. per lb.	3s. 7d. per lb.
May to November	4s. 8d. per lb.	4s. 5d. per lb.

Northern Rhodesia	*First Grade Cream*
January to June	3s. 6d. per lb.
July to December	4s. 3d. per lb.

The wholesale and retail prices for butter were reduced by 1d. per lb. from the beginning of 1958 to the following prices:—

Southern Rhodesia	*First Grade*	*Second Grade*
Wholesale	3s. 6d. per lb.	3s. 4d. per lb.
Retail	3s. 11d. per lb.	3s. 9d. per lb.

Northern Rhodesia	*First Grade*
Wholesale	3s. 7d.
Retail	4s. 0d.

All butter is graded by a Dairy Officer before sale in Southern Rhodesia but no such grading is carried out in Northern Rhodesia. The comparative grades of butter manufactured in recent years are given in Tables VII and VIII as percentages of total production.

TABLE VII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE — SOUTHERN RHODESIA

Year	*First Grade per cent.*	*Second Grade per cent.*	*Third Grade per cent.*
1953/4	78·5	13·5	8·0
1954/5	87·0	9·0	4·0
1955/6	86·6	9·8	3·6
1956/7	87·2	8·6	4·2
1957/8	87·0	9·0	4·0

TABLE VIII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE — NORTHERN RHODESIA

Year	*First Grade per cent.*	*Second Grade per cent.*	*Third Grade per cent.*
1956/7	96	1	3
1957/8	96	3	1

CHEESE FACTORIES, CHEESE PRODUCTION AND CONSUMPTION

Seven registered cheese factories operated during the year. These are situated at Chipinga, Umtali, Salisbury, Gatooma, Gwelo, Bulawayo and Mazabuka. The factory at Gatooma only produced a very small quantity of Roquefort cheese on an experimental basis early in the season as, due to alterations which had to be made to the dairy, cheese manufacture had to be temporarily discontinued. The quantity of farmhouse cheese manufactured was very small and only one farmer manufactured cheddar cheese.

Total cheese production shows an increase over previous years with the main increase evident in gouda cheese manufacture. Cheese production in Northern Rhodesia was slightly less than in the previous year.

Cheese manufactured by the Dairy Marketing Board was exhibited at the Rand Easter Show and a number of awards were won including silver trophies and medals. This shows that the cheese produced in Rhodesia compares very favourably indeed with cheese produced in South Africa.

Sufficient cheese is being produced in the Federation to meet the demand for the basic types, viz., cheddar and gouda, and some cheese was exported to the Union of South Africa. Some of this cheese was exported on an exchange basis in order to dispose of excessive stocks due to seasonal production and a similar amount was imported later when local stocks had been reduced. There

was, however, a substantial true export of gouda cheese. Various types of cheese not manufactured locally were imported according to local demand.

From cheese sales figures it is apparent that consumption of cheese in the Federation is still increasing and now amount to about 2,500,000 lb. per annum, but actual statistics are not yet available.

The quality of the cheese produced was generally satisfactory although certain faults still have to be investigated. All cheddar cheese produced in Southern Rhodesia is graded before sale but no such grading is carried out in Northern Rhodesia. Table IX shows the percentage of each grade of cheddar cheese graded in Southern Rhodesia in the last five years.

TABLE IX

CHEDDAR CHEESE GRADINGS AS PERCENTAGE OF TOTAL CHEESE GRADED IN SOUTHERN RHODESIA

Year	*First Grade*	*Second Grade*	*Third and Below Grade*
1953/4	47·9	13·6	38·5
1954/5	83·8	13·8	2·4
1955/6	94·9	4·2	0·9
1956/7	96·1	3·5	0·4
1957/8	97·3	2·4	0·3

A spcial subsidy of 6d. per lb. on cheese produced was paid to the Gazaland Co-operative Cheese Factory, Chipinga, and to the one farmhouse cheesemaker who produces cheddar cheese. Cheese production by the Gazaland Co-operative Cheese Factory at Chipinga was approximately 125,000 lb. which was less than during the previous year due to another poor season in that area.

Wholesale prices for cheddar and gouda cheese remained unchanged but the retail price was increased by 1d. per lb. in Southern Rhodesia at the end of September, 1958. This had the effect of increasing the retail margin by 1d. per lb. Wholesale and retail prices for 1st grade cheddar and gouda cheese at 30th September, 1958, were:—

	Wholesale	*Retail*
Southern Rhodesia . .	2s. 6d. per lb.	2s. 11d. per lb.
Northern Rhodesia . .	3s. 0d. per lb.	3s. 6d. per lb.

MILK SUPPLIES AND MILK PRICES

Milk production continued to increase and this increase is reflected in milk receipts by the Dairy Marketing Board in Southern Rhodesia and the Co-operative Creameries in Northern Rhodesia. Tables X and XI give the milk intake figures of these two organisations and the quantity of milk used by them to meet the whole milk demand.

TABLE X

DAIRY MARKETING BOARD — SOUTHERN RHODESIA

Year	*Total Milk Intake,* 1,000 *Gallons*	*Apparent Consumption as Whole Milk,* 1,000 *Gallons*	*Surplus over Whole Milk Requirements,* 1,000 *Gallons*
1953/4 . . .	6,488	5,462	1,026
1954/5 . . .	7,817	5,941	1,876
1955/6 . . .	8,852	6,388	2,464
1956/7 . . .	9,736	6,654	3,082
1957/8 . . .	10,794	7,158	3,636

TABLE XI

CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

Year	*Total Intake,* 1,000 *Gallons*	*Apparent Consumption as Whole Milk,* 1,000 *Gallons*	*Surplus over Whole Milk Requirements,* 1,000 *Gallons*
1956/7 . . .	1,880	1,315	565
1957/8 . . .	2,211	1,686	525

Milk supplies have increased at a greater rate than whole milk consumption in Southern Rhodesia and at approximately the same rate in Northern Rhodesia. These surpluses are not reflected directly in increased cheese production during the year under review as an increasing amount of this surplus is disposed of in other ways such as skim milk, dried skim milk and sterilized milk.

The differential price system continued to operate in both territories. There were no changes in the guaranteed standard milk prices which are payable for milk used as whole milk plus a safety margin until July, 1958, but the safety margins were reduced in June, 1958, to the monthly equivalents of 750,000 gallons per annum in Southern Rhodesia and 243,000 gallons per annum in Northern Rhodesia. Following the reduction in the maize subsidy in July, 1958,

standard prices in both territories were increased by 1d. per gallon to offset the increase in the price of purchased foodstuffs.

Actual producer milk prices in Southern and Northern Rhodesia are comparable but the standard price in Northern Rhodesia is a price at farm gate, while in Southern Rhodesia the standard price is the price delivered to the dairy. Also a different bonus system operates and although the principle has been accepted that the same prices and bonus systems should operate in both territories it has not yet been possible to institute the milk testing scheme operated in Southern Rhodesia in Northern Rhodesia owing to shortage of Dairy Officers and no change was made during the year. The two territories operate separately as far as price calculations, according to the differential price system, are concerned.

It is hoped that provision will be made for an additional post of Dairy Officer in the 1959/60 estimates so that the milk testing scheme can be introduced in Northern Rhodesia for the payment for milk on a quality basis and that both territories will be on exactly the same price structure although separate "pools" may operate.

The Zambezi Co-operative Dairies at Livingstone and the Karoi Dairies at Karoi receive milk from a small number of local producers and retail in their respective areas. These dairies are not included in the price structures as operated by the Dairy Marketing Board and the Co-operative Creameries of Northern Rhodesia. Producer retailers also operate throughout the two territories and it is worthy of note that these producers are in a favourable position compared with suppliers to the dairies, particularly on the Copperbelt where the retail price of milk gives a return of 6s. 8d. (including bonus) as compared to a return of the equivalent of about 3s. 6d. per gallon (including bonus and transport) to suppliers to the Co-operative Creameries.

Tables XII and XIII show the guaranteed standard prices in Southern and Northern Rhodesia respectively, the actual payout under the differential price system for 1957/58 and the actual payout for the previous year.

TABLE XII

SOUTHERN RHODESIA

Month	*Standard Price per Gallon,* 1957/58	*Actual Payout per Gallon,* 1957/58	*Actual Payout per Gallon,* 1956/57
October	4s. 2d.	3s. 7·4d.	3s. 8·9d.
November	4s. 2d.	3s. 5·7d.	3s. 6·4d.
December	3s. 0d.	2s. 6·2d.	2s. 5·7d.
January	3s. 0d.	2s. 6·1d.	2s. 6·1d.
February	3s. 0d.	2s. 8·2d.	2s. 7·8d.
March	3s. 10d.	3s. 5·3d.	3s. 5·2d.
April	3s. 10d.	3s. 5·3d.	3s. 5·7d.(*a*)
May	3s. 10d.	3s. 5d.	3s. 6·5d.
June	3s 10d.	3s. 5·7d.(*b*)	3s. 7·1d.
July	4s. 3d.(*c*)	3s. 8·9d.	3s. 9·6d.
August	4s. 3d.	3s. 7·8d.	3s. 8·3d.
September	4s. 3d.	3s. 6·4d.	3s. 8d.

(*a*) "Safety margin" was reduced from 20 per cent. of whole milk sales to 83,333 gallons per month and standard prices increased by 2d. per gallon;

(*b*) "Safety margin" was reduced to 62,500 gallons per month;

(*c*) Standard prices were increased by 1d. per gallon.

TABLE XIII

NORTHERN RHODESIA

Month	*Standard Price per Gallon,* 1957/58	*Actual Payout per Gallon,* 1957/58	*Actual Payout per Gallon,* 1956/57
October	4s. 0d.	4s. 0d.	3s. 10d.
November	3s. 5d.	3s. 5d.	3s. 3d.
December	2s. 4d.	2s 3·35d.	2s. 2d.
January	2s. 4d.	2s. 2·17d	2s 2d.
February	2s. 4d.	2s. 3·48d.	2s. 2d.
March	3s. 5d.	3s. 5d.	3s. 3d.
April	3s. 5d.	3s. 3·75d.	3s. 3·53d.(*a*)
May	3s. 5d.	3s. 3·2d.	3s. 4·67d.
June	3s. 5d.	3s. 1·8d.(*b*)	3s. 5d.
July	4s. 1d.(*c*)	3s. 7·5d.	3s. 11·88d.
August	4s. 1d.	3s. 6·7d.	3s. 10·41d.
September	4s. 1d.	3s. 6·7d.	3s. 11·97d.

(*a*) Differential price system introduced with "safety margin" of 27,000 gallons per month;

(*b*) "Safety margin" reduced to 20,250 gallons per month;

(*c*) Standard prices increased by 1d. per gallon.

Retail prices for milk remained unchanged at 7d. per pint cash and 7¼d. per pint credit in Southern Rhodesia, 7½d. per pint in the Midlands of Northern Rhodesia and 8½d. per pint on the Copperbelt until the end of August when Northern Rhodesia prices were increased by 1d. per pint to 8½d. per pint in the Midlands and 9½d. per pint on the Copperbelt.

FRESH CREAM

The demand for fresh cream was met by producers who supply cream to agents in the towns and by the main dairies. There appears to be keen competition in this trade and while this may be desirable there is a danger that quality may be sacrificed in order to lower the price and increase the retailers' margin. It is suggested that if the name of the producer were clearly printed on each carton, purchasers could ask for cream from a specific source and this would ensure that the general quality of the cream would be maintained.

DRIED MILK AND STERILIZED MILK

Dried skim milk was produced by the Dairy Marketing Board at Gwelo and this proved a useful outlet for surplus milk especially as it had the effect of increasing butter production. Owing to a serious drop in world prices for skim milk powder, it became necessary to reduce the price of the local product to dispose of accumulated stocks. This product is sold in wholesale quantities in paper sacks and also in 1 lb. packets for retail trade.

A new Stork sterilized milk plant was installed at Lusaka and came into operation towards the middle of 1958, while a "Perfection Sterilizer" was installed in Bulawayo and produced experimental batches of sterilized milk in August and September. These plants are used to produce sterilized flavoured milks as well as straight sterilized milk.

DAIRY BONUS SCHEME

This scheme which operates in Southern Rhodesia has been continued. Payments under the scheme during 1957/58 which apply to production in the year 1956/57 amounted to approximately £13,000.

Payments for the year 1957/58 are likely to be about £14,000, of which about £9,000 will be paid on butterfat and £5,000 on cheese milk in the Chipinga area where special conditions are applied. It is apparent that a number of producers make use of this scheme as a stepping stone to entering the whole milk market and that a number of producers supplying whole milk to the Dairy Marketing Board are drawing this bonus on butterfat derived from the separation of milk for domestic use on the farms.

MILK RECORDING

Owing to the fact that the establishment of Milk Recorders was not increased no expansion of the Milk Recording Scheme was possible during the period under review. Only one Milk Recorder is stationed in Northern Rhodesia and the extension of the scheme to that territory has had to be limited to semi-official recording in the Midlands area where 37 herds are now being recorded.

The effort made to dispose of the backlog of office work which has accumulated owning to the extension of the scheme in recent years without a corresponding increase in office staff has been fairly successful and with the appointment of an additional clerical officer it is hoped that this can be brought up to date during the current season. It is hoped that it will be possible to send the Dairy Officer specially appointed for Milk Records overseas for a period of training at the Milk Marketing Boards in the United Kingdom during the next financial year.

Table XIV gives the results of the Annual Milking Competitions for the last five years for which statistics are available and Table XV gives the average production per cow recorded.

TABLE XIV

PRODUCTION OF WINNING HERDS IN MILKING COMPETITIONS,

AVERAGE OF BEST 15 COWS IN THE HERD

Year	*Milk Section*	*Butterfat Section*
1951/2	15,207 lb.	493·2 lb.
1952/3	13,548 lb.	486·0 lb.
1953/4	12,917 lb.	440·8 lb.
1954/5	13,772 lb.	496·6 lb.
1955/6	14,551 lb.	486·1 lb.

TABLE XV

AVERAGE PRODUCTION PER COW — PEDIGREE AND GRADE HERDS

Year	Completed Lactations	Average Milk Production, per Cow	Average Butterfat Production per Cow	Percentage Butterfat	Days
1951/2 . . .	5,436	6,412	244·1	3·81	279
1952/3 . . .	5,554	6,265	228·3	3·64	274
1953/4 . . .	5,798	6,583	236·1	3·59	279
1954/5 . . .	7,330	6,415	246·9	3·85	280
1955/6 . . .	8,095	6,400	250·5	3·91	277

GENERAL

The Dairy Industry continues its rapid development and in addition to the increases in production a corresponding development of handling and processing facilities has taken place. The new dairy at Kitwe was opened in June, 1957, and increased sales of milk were made on the Copperbelt during the period under review. Most of this milk was transported in road tankers from Mazabuka and Lusaka to Kitwe. A Stork sterilising plant was installed at Lusaka and the pasturizing capacity of that dairy was increased. New plant was installed at Mazabuka to increase the capacity of that dairy and a completely new dairy was built at Broken Hill. Certain structural alterations were made to the Model Dairy at Bulawayo and new plant installed including a new pasteurizer and a small sterilizing plant. A new roller drier was purchased for Gwelo and is being installed in a new building erected for that purpose. Alterations have been made to the dairy at Gatooma to cope with the increasing milk intake. Tetrapak machines have been installed at the Salisbury and Kitwe dairies for the sale of milk in cartons and the building of a new dairy in Salisbury has been started. A Vacreater and an automatic butter wrapping machine have been installed by Messrs. Hodgson and Myburgh at their Emco Creamery in Umtali.

Negotiations are continuing with Nestle's for the establishment of a milk powder factory in Southern Rhodesia.

Exports of pasteurized milk to Portuguese East Africa increased from about 53,000 gallons in 1956/57 to about 55,000 gallons in 1957/58. This increase would have been greater if the Portuguese Government had not imposed quantitive restrictions for a part of the year. Since these restrictions have been removed there has been a monthly increase in these exports and during September over 6,000 gallons were exported.

In June, 1957, the Federal Minister of Agriculture appointed a committee to investigate the dairy industry and this committee presented its report to the Minister at the end of March, 1958.

DAIRY BRANCH ACTIVITIES

Since the beginning of 1956 when European agriculture in Northern Rhodesia was placed under the control of the Federal Government, statutory and advisory duties concerning all aspects of dairying in Northern Rhodesia have been carried out by the staff of this branch. Two Dairy and Poultry Officers were taken over from the Northern Rhodesia Government and were seconded to the Department of Conservation and Extension of the Federal Ministry of Agriculture in Northern Rhodesia to carry out these duties. One of these officers resigned in September, 1957, and a Dairy Officer from Southern Rhodesia was promoted to the senior post in Northern Rhodesia. Since July, 1958, this officer has operated as a direct member of the Dairy Branch while the remaining Dairy and Poultry Officer, who is now mainly concerned with poultry matters, remains on secondment to the Department of Conservation and Extension. Therefore, by the end of the season under review two officers of the Branch, viz., a Dairy Officer and a Milk Recorder, were stationed in Northern Rhodesia and a Dairy and Poultry Officer, nominally on Dairy Branch strength, was seconded to the Department of Conservation and Extension.

The staff position has been eased by the recruitment of two Dairy Officers to fill the vacancies in the establishment of the Branch and an additional clerical officer has been appointed. With the increasing duties devolving upon the Branch due to the expansion of the industry and the extension of additional services to Northern Rhodesia, the position is still very difficult and it is hoped that additional posts will be provided for the year 1959/60.

The Chief Dairy Officer visited the United Kingdom and Holland at the end of 1957 to attend the Dairy Show, examine recent developments in the industry and recruit staff.

Services provided by the Branch include statutory inspections and registration of factories and farm dairies, grading of dairy produce, sampling and testing of milk, both for advisory purposes and for the operation of the scheme for the payment for milk on a quality basis, advisory work on production of milk and manufactured products, lecturing at Gwebi Agricultural College, judging of dairy produce at Agricultural Shows and operating the Milk Recording Scheme.

The Chief Dairy Officer or his deputy attended all meetings of the Dairy Marketing Board and various committee meetings, and was Chairman and Convenor of the Committee appointed by the Minister to investigate the dairy industry. Various meetings of farmers' organizations were attended by Officers of the Branch.

Every effort has been made to maintain all services and duties at a high level of efficiency and particular mention must be made of the willing and loyal co-operation of all officers and staff during another year when staff vacancies and increasing duties have necessitated long hours of work to maintain services.

PASTURE RESEARCH

DR. O. WEST

CHIEF PASTURE RESEARCH OFFICER

INTRODUCTION

The need for a central organization for the Branch of Pasture Research and Ecology is becoming increasingly evident. Many of the important functions of the branch including the introduction, selection and trial of herbage plants and the carrying out of ecological and land use surveys can only be performed efficiently by a central organization, which is required too for the proper co-ordination of the work of the regional stations. A memorandum pointing out the need for re-organization and suggesting a suitable organization for the Branch which would increase its efficiency and output has been submitted to the Director of Research and Specialist Services. It is feared that because of the prevailing financial stringency there is no immediate prospect for effecting even a beginning of this re-organization, so urgently necessary for the proper functioning of the branch.

THE RESEARCH STATIONS

Detailed reports on the pasture investigations and ecological studies in progress are included in the station reports. New work and developments of particular interest dealt with in these reports are:—

GRASSLANDS RESEARCH STATIONS

1. The failure of the Alta Tall Fescue, Cocksfoot and Clover mixture to supply grazing during the cold months of winter has focussed attention on the need for research in the composition of mixtures and in the use of short term leys to supply grazing during this difficult time. Critical studies on these lines have been started.

2. Very interesting and important investigations are being made into the growth of dryland pasture grasses. These investigations include studies of the undisturbed growth cycle and of growth in relation to various frequencies and intensities of defoliation as well as the cycles of depletion and accumulation of carbohydrate reserves. They are designed to provide information which is basic and essential for a proper understanding of the principles of management of established grasses. A beginning has been made in a study of the effect of fertilization on the seed production of dryland pasture grasses.

4. The effect of species composition and length of ley, level and time of nitrogen application and intensity of grazing on the build up of productivity under the ley as measured by subsequent crops including tobacco is being studied in a number of experiments.

5. A laboratory for the study of legume-rhizobium relationships has been established and work in this important field has commenced.

6. Digestibility studies on the new dryland pasture grasses will shortly be commenced.

HENDERSON RESEARCH STATION

1. Work at Grasslands has shown that properly fertilized and managed, improved dryland pastures are capable of satisfying during the rainy season all the requirements of a dairy cow producing up to three gallons of milk. Henderson are now embarking on an investigation of the possibility of seasonal milk production, using the summer flush to produce milk as cheaply as it can be produced, avoiding the necessity for feeding concentrates by using a herd with a level of production within the capacity of the pasture and by synchronizing production with the productive season.

2. Work on fodder sequences designed to meet the requirements of different classes of stock is proceeding and is being used as a framework for more critical studies.

3. Very satisfactory results have been obtained in the inter-row seeding of maize and legume crops with pasture grasses.

4. A preliminary investigation of the possibility of substituting high quality hay from irrigated pastures for milk in the rations of dairy calves is showing considerable promise and may solve some of the problems concerned with the utilization of the production from small acreages of irrigated pasture.

Matopos Research Station
(Including Nyamandhlovu and Tuli Pasture Sub-stations)

1. At Matopos in the thornveld grazing management trial, a dramatic response to the heaviest stocking rate (1-8) has become apparent in Experiment 30. This response, evidenced by a sudden and very obvious loss of vigour in the grass sward, was anticipated when the experiment was put down, but has taken approximately eight years to become manifest.

It follows the sudden deterioration in some of the veld burning plots which was noted last year.

2. The suppressive effect of fire on bush is becoming increasingly evident at the lighter stocking rates in all of the grazing management experiments.

In the *Thornveld* experiments the effect has been gradual but in *Burkia-Terminalia* woodland in the sandveld at Matopos and on Karroo sands at Nyamandhlovu, a spectacular effect has been obtained with dense woodland giving way rapidly to induced grassland.

3. The three herds in four paddocks system of management is being tested at five different stock rates on cleared and on uncleared thornveld at Matopos.

4. Very encouraging results have been obtained with steers grazing on Katambora Rhodes Grass sprayed with a Urea-molasses mixture.

6. At Tuli a very great difference in the amount of grass produced in cleared paddocks as compared with similar but uncleared paddocks was measured.

Cleared Paddock	...	2,883 lb. air dry grass per acre
Uncleared Paddocks	...	660 & 708 lb. air dry grass per acre

Melsetter Pasture Station

1. At Melsetter White Clover has been successfully introduced into a Kikuyu pasture after rotavation. Several previous attempts to introduce clover into this pasture were unsuccessful.

2. Excellent stands of the new seeding grasses *Katambora Rhodes* grass, *Kasungula setaria* (Grasslands strain) and *Sabi Panicum* have been established, and

3. Preliminary investigations into the use of *Pigeon Pea* in conjunction with these grasses and with *Napier Fodder* have been commenced.

4. At Melsetter where soil moisture is sufficient and frosts are very light, *Napier Fodder* is proving extremely valuable for early and late dry season grazing.

5. An investigation into the possibility of improving veld grazing by fertilization and other treatments followed by the introduction of clovers and improved grasses has been commenced.

Gatooma and Sabi Research Stations

There is a very definite need for the initiation of research into pasture management and veld ecology at both the *Gatooma* and *Sabi Research Stations*. These stations represent important ecological areas about which information is urgently required and where the climate is very different from that obtaining on any of the other research stations.

Gatooma because it is frost free is ideally suited to an investigation of the utilization of *Pigeon Pea* foggage in dry season grazing, an investigation of the utmost importance to other frost free areas in Southern Rhodesia and one that would apply to much of Northern Rhodesia and Nyasaland.

At Sabi there is an urgent need for preliminary work in the establishment and management of pastures. It is very probable that pastures have a vital role to play in maintaining productivity in irrigation rotations. They are certainly essential if animals are to play an important part and it is logical that a solution of the pasture problems should precede any animal husbandry investigation.

PASTURE SUB-STATION FOR THE EASTERN KALAHARI SAND AREAS

The eastern Kalahari sand areas (Beatrice, Featherstone, Umvuma, Felixburg) show very interesting pasture possibilities. A considerable acreage of these soils exhibit a high water table and appear suitable for growing a wintergreen grass clover pasture without irrigation, i.e., a pasture which should be capable of producing milk during the dry season. This is an area where the establishment of a pasture sub-station should receive very serious consideration.

PASTURE SEED PRODUCTION

On the 30th September, 1957, the amount of registered grass seed produced by members of the *Rhodesia Pasture Seed Growers' Association* was estimated at 36,000 lb. This was a very conservative estimation as the amount of registered seed actually sold amounted to 44,571 lb. In addition sales of unregistered seed grown by farmers who were not members of the R.P.S.G.A. totalled 13,073.

The following table shows how these quantities were made up:—

Grass seed produced in Southern Rhodesia 1957	Katombara Rhodes Grass	Giant Rhodes Grass	Bambatsi Panicum	Napier Love Grass	Totals
Registered seed . .	30,891	1,994	861	10,825	44,571
Unregistered seed .	5,670	1,541	—	5,862	13,073
TOTALS . . .	36,561	3,535	861	16,687	57,644

This table includes only the seed sold through the official agents to the R.P.S.G.A.

It is of interest to note that 9,935 lb. of *Weeping Love Grass* seed were imported from the Union of South Africa and so presumably 26,622 lb. of *Weeping Love Grass* seed were sown during the season 1957-58. This is sufficient for approximately 8,874 acres.

During the 1957-58 season 1,300 acres were registered for seed production, but because of the poor season, seed was harvested from only 580 acres. Although this 580 acres included some very poor crops the total amount of registered seed produced shows a big increase over previous seasons crops.

The estimated quantities of registered seed harvested in 1958 are shown below:—

	Katambora Rhodes Grass	*Giant Rhodes Grass*	*Weeping Love Grass*	*Bambatsi Panicum*
Estimated yield . .	50,000 lb.	3,500 lb.	15,000 lb.	300 lb.

It is estimated that total sales will exceed 80,000 lb.

It is of interest that one grower reaped 25,000 lb. of seed from 120 acres of *Katambora Rhodes Grass*, most of it by combine harvester.

Weeping Love Grass seed yields from dryland stands were as usual extremely disappointing, but growers using irrigation and taking a seed crop in October are obtaining very good crops.

HERBAGE PLANT INTRODUCTION

Clover species introduced from East Africa are showing considerable promise. The perennial *T. semipilosum* is exceptionally deep rooted and has demonstrated its ability to survive the dry season on topland at Grasslands, in a trial in which both Red and White clover were almost entirely eliminated by drought.

Several of the annual clovers re-seeded successfully and made good growth in the following season.

The most promising of these clovers will be tried at a number of centres during the coming season.

A recumbent *Desmodium sp.* introduced from Nyasaland has made magnificent growth over two seasons at Grasslands. Unfortunately it flowers very late in the season and frosts have prevented seed setting.

A perennial climbing *Dolichos (Lab Lab) sp.* from the Eastern Districts is doing well at both Melsetter and Grasslands. It is much sought after by Bush Buck.

Tree Lucerne introduced from New Zealand shows promise and further work on the species is desirable.

The new strain of *Panicum maximum*, foundation seed of which was released last year as *"Sabi Panicum"* has been registered with the R.P.S.G.A. and the first crop of mother seed produced.

The new *Cunene Nile Grass* is being tested at several centres.

Results to date indicate that this variety is much more productive than any variety of *Nile grass* previously cultivated.

Work on improving the seeding ability of *"Shamva Digitaria"* and *"Zhilo Panicum"* is proceeding.

Attention is being focussed on the genera *Echinochloa* and *Chloris* and our collection of species and ecotypes is being expanded as rapidly as possible. Interesting material has been collected on the Lower Shire, the Kafue, the Zambesi and from pans in the Sabi Valley and in the Wankie Game Reserve.

Interest in "Bambatsi Panicum" and in "Katambora" Rhodes Grass is being evinced in both Australia and in the Union of South Africa. Bambatsi is an outstanding grass at Matopos where also during the present dry season very encouraging results were obtained from feeding Bambatsi hay. This indication will be followed up next season.

During the year requests for seed and/or planting material have been received from the Argentine, Australia, Belgian Congo, Kenya, Northern Rhodesia and the Union of South Africa. These requests have all been complied with.

ECOLOGICAL AND LAND USE SURVEY

At the Pasture Research Conference in 1957 it was stressed that there was a need for the commencement of an *Ecological and Land Use Survey,* with permanent staff and facilities.

There is undoubtedly a need for the appointment of an ecologist, who could be trained in the work and who together with the C.P.R.O. could form the nucleus of a future organisation.

Without staff it is difficult for the C.P.R.O. to touch more than the fringes of this work which is so necessary both in itself and for land use planning.

Nevertheless preliminary surveys and exploratory journeys have been made with

The Irrigation Department on the Zambesi in Northern Rhodesia,

The Department of Conservation and Extension in the Filabusi and Felixburg areas,

The Department of Native Agriculture in the Beit Bridge district.

Over 300 specimens including some new records, have been collected and lodged in the herbarium of the branch of Botany and Plant Pathology and much useful information that will be invaluable when mapping can be commenced, has been accumulated. Further preliminary surveys for Conservation and Extension and for National Parks are pending and will be undertaken as soon as opportunity offers.

ROAD VERGE VEGETATION

The Branch of Pasture Research and Ecology is co-operating with the *Central Roads Laboratory* of the Division of Roads and Road Traffic in their endeavour to replace undesirable road verge vegetation, principally rhizomatous grasses (e.g. *Cynodon dactylon)* which damage the road surface by breaking up the tar mat or tall vigorous grasses (e.g. *Hyparrhenia spp.)* which require frequent cutting, by a desirable cover which will prevent erosion and deter the encroachment of the undesirable species. Preliminary experiments involving several species of grasses will be carried out during the coming season on the Bulawayo-Falls road in Kalahari sand and on the great north road between Sinoia and the escarpment.

The possibility of undertaking a countrywide survey of Road Verge Vegetation is under discussion.

NATIONAL PARKS

A preliminary survey of the National Parks is being carried out as opportunity offers. The purpose of this survey is to recognize and define the ecological trends and problems which are likely to affect the future of the parks.

CONFERENCES AND VISITORS

The *Pasture Research Committee* met at Matopos Research Station from 7-9 of July. During this meeting the members of the committee made a close study of the Pasture Research investigations at Matopos and at Nyamandhlovu.

The Pasture investigations at the Tuli sub-station were considered at a meeting held at Tuli on the 1st September between members of the Department of Native Agriculture and of this Branch.

An *African Weed Control Conference* sponsored by Messrs. Fisons Pest Control was held at the Victoria Falls from 23-26 July. This was an important conference attended by a great number of delegates from other African territories and from the United Kingdom. Two papers on the subject of bush encroachment in Southern Rhodesia and in the Federation were presented by members of this Branch.

The Chief Pasture Research Officer attended the Regional conferences of the Department of Conservation and Extension at Bulawayo, Gwelo, Umtali and Salisbury.

Mr. N. H. Shaw, Principal Research Officer, C.S.I.R.O. Plant and Soils Laboratory, Brisbane, visited the Federation 27th March to 3rd May to see the pasture work in progress. He spent approximately four weeks in Southern Rhodesia during which time he visited all of the research stations.

Other interesting visitors to the Pasture Research work included the members of the Oxford Unit of Experimental Agronomy, who attended the African Weeds Conference, Professor Blackman, Dr. E. K. Woodford and Mr. J. D. Fryer.

PAPERS

1. WEST, O. "Report to the Government of Malaya on Grassland and Fodder Resources." Published as F.A.O. Report No. 728. Rome 1957.
2. „ "Brief summary of trials with Herbicides on Trees and Scrub at the Marandellas and Matopos Research Stations." Published in Pesticides Abstracts and News Summary. Sect. C. Vol. 4 No. 1. January, 1958.
3. „ The need for a joint and positive approach to the Problem of Bush Control in the Federation of Rhodesia and Nyasaland and other African Territories.
   African *Weed Control Conference* 1958.
4. „ Bush Encroachment, Veld Burning and Grazing Management R.A.J. July-August, 1958.
5. „ Complete revision of the "Veld and Improved Pastures" section of the Farming Calendar Bul. 1410 to be republished for D.C. & E.
6. „ "The Ecology of an Area", a guide for officials of the Department of Conservation and Extension engaged in preparing ecological descriptions of particular areas.

   A memorandum prepared for the Director of Conservation and Extension.
7. „ "Progress in Pasture Improvement", part of the Progress Report to the 6th Annual Meeting of S.A.R.C.C.U.S., Lourenco Marques 1958, on Conservation in the European Areas of Southern Rhodesia. Published in the minutes of that meeting.
8. „ "Laws, Regulations or Customs for controlling grazing animals on range lands, common lands or forests in Southern Rhodesia."
   Memorandum prepared for the Director of Commonwealth Bureau of Pastures and Field Crops. To be published.

Papers by other members of the branch are listed in the appropriate sections of this Report.

ACKNOWLEDGEMENT

I am glad to acknowledge the very full and helpful co-operation I have enjoyed with the staffs of the Research Stations during the year.

POULTRY

G. H. COOPER

CHIEF POULTRY OFFICER

Poor marketing conditions reported in 1957 have deteriorated further during the year and it must be acknowledged that egg production in Southern Rhodesia has been carried on at a loss by many producers. Table bird and chick producers have not suffered to the same extent, but in the second half of the year the increased feed costs have affected business. In Northern Rhodesia conditions have been slightly more favourable for producers.

ORGANIZATION

The poultry producer is represented in the R.N.F.U. structure by the National Poultry Committee whose members are elected by branch Associations. In Salisbury and Bulawayo, where strong Poultry Clubs or Associations are in existence, delegates from these are now afforded representation on the R.N.F.U. Poultry Committee, an arrangement which has been welcomed by non-R.N.F.U. producers and provides for broader representation. A similar move is anticipated in Northern Rhodesia, where a Poultry Producers' Association is being formed. It would appear from this that in future poultry problems for consideration either by the R.N.F.U. Council or, through them, the Government will be sponsored by representatives from a wider circle of producers, which in the case of poultry is very important as probably the majority are not licensed farmers.

MARKETING

There are no organized marketing arrangements for poultry products, the producers having voted in the past against any controlled marketing system. Imports of poultry products are controlled under permit from this Department. The Agricultural Marketing Council has taken evidence during the year from interested bodies in respect of the grading of eggs and poultry and has submitted proposals for a voluntary grading scheme based on the National Mark system. These proposals have been accepted by the R.N.F.U. Poultry Committee and now require the backing of a reasonable number of producers before being submitted to the Minister for decision. It would seem that these proposals are likely to gain favour and be in general usage shortly, to the advantage of producers and consumers alike. It is hoped they may lead to compulsory grading regulations for the industry in due course.

The marketing of eggs has seen no major developments during the year and continues along the same lines of wholesale, retail, and contract buying direct from producers as in the past. The Cold Storage Commission's stock of egg pulp remaining for their past handling of eggs have now been sold, and also the stocks held by the Rhodesia Malt Products, Ltd., wholesalers in Salisbury, have been exported. As this firm has had great difficulty in disposing of egg pulp during the last two seasons they now only pulp for definite contracts which can largely be maintained from the normal wastage from cracked and pullet eggs received. Therefore there are no large stocks of egg pulp held in the Federation.

Chilled eggs are also not stored to any extent as they are not popular with the consuming public and commercial users prefer pulp.

The commercial consumers have imported some synthetic egg products which, together with the lower prices prevailing for fresh eggs during most of the year, have reduced the demand for stored eggs; wholesalers therefore have diverted the surplus eggs during the spring and early summer to industrial African consumption which can take up considerable quantities of eggs at prices which should just cover production costs at this season. As reported last year this outlet should be encouraged and will undoubtedly increase in volume.

It is significant that egg sales to European consumers are even lower when eggs are in free supply and at their lowest price than when production is less in the autumn and winter and prices higher. The reason for this is that in the Federation a very high proportion of householders keep backyard poultry which provide eggs for the owner and probably one or two of his neighbours during the spring and summer season, but which frequently fail to produce at other times due to bad management and age of stock. Also the question of quality encourages the keeping of backyard poultry as there can be no doubt generally speaking the direct sale of a perishable commodity provides for higher quality. In addition, the price factor is frequently no consideration as the feed costs are usually borne by the family grocery account and the sale of surplus eggs affords pin money for one or other member of the family. Taken all round this question of the backyard producer has a most serious effect on the producer who is endeavouring to make a living from egg production because it is quite

unpredictable in quantity, thus causing considerable fluctuations in prices and reducing consumption. It also results in price-cutting as production costs are, as indicated, seldom considered.

It will be seen therefore that the poultry producer is up against internal competition that no other section of the farming community—except perhaps vegetable production—has to contend with. Whilst it is obviously undesirable and probably impossible to restrict the keeping of backyard poultry, I am convinced that the rather violent changes in prices and also in the people engaged in poultry production cannot be stabilized until the consuming public in proportion to the backyard producers is increased, which is the case in most countries. In order to make backyard poultry keeping for gain less attractive I am of the opinion that all those who sell poultry products should be required to take out the £5 Farmer's Licence annually, which would reduce their numbers considerably.

The maize farmer, cattle, pig, and dairy farmer, is protected from this type of unfair competition by the very nature of his product, but should support poultry farmers in their endeavours to stabilize their marketing and thus add considerably to farm income which at present is being lost to a section of the community with self interest the only consideration. Examination of the statistics shows that producers with under 100 birds comprise about three-quarters of the total numbers and own one-sixth of the total number of fowls. The next category up to 250 fowls is the next largest in number and owns a further one-eighth of the fowls.

Eggs have been in full supply in Northern and Southern Rhodesia except for a short period in May. Movement of supplies from South to North took place in the winter.

The marketing of table poultry continued along the same lines, the majority of producers processing their birds and selling to retail outlets or on contract to consumers. The Rhodesia Refrigerating Co., operating in Bulawayo and Salisbury, have expanded their operations by building new premises for processing in Bulawayo and by providing two mobile vans in the Salisbury area which proceed to farms where they carry out the killing and dressing of birds, returning with them to cold storage in Salisbury. This venture has been very acceptable to farmers and is proving successful in stabilizing production of broilers in particular. This service is extended to a 50-mile radius from Salisbury and should enable this company to acquire more birds locally to assist in their trade to Northern Rhodesia and thus to cut the import requirements of that area in due course. Some very good quality table poultry is now attractively marketed but there is still room for a great deal of improvement in quality in a high proportion of poultry sold by butchers. It is hoped the proposed grading of table poultry, if accepted, will improve this position for both producer and consumer.

The sales of day-old chicks for broiler production have increased and several breeders for this class of stock supply chicks throughout the year. The sale of chicks for flock replacement has been average, with little if any advance on last year. Low prices for eggs at the end of the season always adversely affect the sale of chicks at that time.

The Salisbury and District Poultry Club are endeavouring to form a Breeders' and Chick Producers' Association with a view to improving stock and the quality of chicks sold. The establishment of this Association should be of great benefit to all engaged in poultry keeping.

PRICES

Egg prices were somewhat more erratic during the season than usual for after the seasonal rise in price from February it declined again rather severely after Easter. May and June were the highest priced months for eggs when prices exceeded 6s. per standard dozen for short periods. Flush season prices from mid-July have been realizing 2s. 9d. retail. The trend is for the higher priced season to be curtailed and therefore the average seasonal price to be lowered. It is estimated the average price this year was about the same as 1956-57 at 3s. 9d. per standard dozen in Southern Rhodesia. Higher prices ruled in Northern Rhodesia. With a further five per cent. rise in cost of feeding during the year, the egg producer has to be more and more efficient to succeed. The profit per bird has been reduced since last year and has now reached an average of about 7s. 6d. per bird, which is as low as I have experienced in thirty years. Such low profit must result in curtailment in production and eventually a steep rise in prices. Other factors are however, influencing the keeping of poultry such as the feeding of surplus grain and the value of manure for permanent pastures, and in such cases the actual profit per bird is not of such vital consequence to the producer.

TABLE POULTRY

With an expanding market for "broiler" type chickens the price level has been maintained and even raised in some instances. Generally, prices of 3s. 6d. to 3s. 9d. per lb. for dressed broilers have been available to producers and 4s. 6d. per lb. to consumers. Live weight prices have been 2s. 3d. to 2s. 6d. per lb. for broilers, 2s. 9d. to 3s. for turkeys, and 1s. 9d. for cull hens.

There is room for increased production of table poultry, particularly in Northern Rhodesia, but realistic prices to producers must be paid before the shortfall is likely to be made up. As with eggs, the increased cost of feeding has lowered profits to a point where some producers are failing.

A Broiler Producers' Association to negotiate prices for producers is needed and it is hoped will be formed next year. If the grading scheme is approved it should help materially in providing improved prices for the better quality birds and in protecting the consumer.

IMPORTS

These consist almost entirely of dressed chickens and day-old chicks from South Africa and are confined to Northern Rhodesia. Imports of day-old chicks have been restricted for the last three years and from next year will cease except for stock unobtainable in the Federation. Representations have been made to the Government to prohibit imports of table birds, for until this is done, it is argued, importers in Northern Rhodesia will not pay reasonable prices for locally produced birds. It has been agreed however, that import permits will not be issued except to persons who are prepared to give unqualified undertakings that they will absorb all local supplies offering at 4d. per lb. in excess of the landed costs of South African supplies, grade for grade. As from January 1st, 1959, this differential will be raised to 6d. per lb., the increase being due to the increased price of grain which took effect in July. It is expected therefore that imports will soon be replaced by local production.

Some importations of chickens for breeding purposes took place from the United Kingdom and Denmark. Imports have been less this year than in 1957.

EXPORTS

The principal export is in day-old chicks from Southern Rhodesia to neighbouring territories. There is also a developing market in the Congo for table poultry. It would appear that table poultry producers on the Copperbelt have an excellent opportunity of increasing production considerably to replace imports to that area and gain a footing in the Congo market. These exports have increased this year.

The following tables give details of the imports and exports of poultry products for the Federation from August, 1957, to July, 1958, inclusive.

TABLE A

IMPORTS

Article and Country of Origin	Quantity	Value
Poultry, live:	No.	£
Union of South Africa	30,855	2,237
United Kingdom	8,162	1,444
Denmark	300	117
TOTAL	39,317	3,798
Poultry, dressed:	lb.	
Union of South Africa	302,772	46,825
United Kingdom	589	122
United States of America	120	20
Tanganyika	76	13
France	27	8
TOTAL	303,584	46,988
Eggs, in the shell:	dozen	
Union of South Africa	6,680	662
Tanganyika	62	12
United Kingdom	26	49
TOTAL	6,768	723
Eggs, liquid or dried:	lb.	
United Kingdom (Industrial)	830	248
Netherlands (Industrial)	239	108
United States of America (Industrial)	1,515	508
TOTAL	2,584	864

TABLE B

EXPORTS

Article and Country of Destination	Domestic Produce		Re-Exports	
	Quantity	Value	Quantity	Value
Poultry, live: No.		£		£
Belgian Congo	43,084	9,168	70	35
Mocambique	18,280	2,254	—	—
Kenya	14,950	1,545	—	—
Tanganyika	4,155	506	—	—
Bechuanaland	250	45	—	—
Uganda	150	18	—	—
TOTAL	80,869	13,536	70	35
Poultry, dressed: lb.				
Belgian Congo	8,770	1,506	724	142
Mocambique	554	151	—	—
Union of South Africa (Tainted, returned)	—	—	11,320	1,651
TOTAL	9,324	1,657	12,044	1,793
Eggs, in the shell: dozen				
Mocambique	8,531	1,511	—	—
Belgian Congo	462	85	—	—
TOTAL	8,993	1,596	—	—
Eggs, liquid or dried: lb.				
Union of South Africa	168,200	11,297	—	—
TOTAL	168,200	11,297	—	—

NUMBERS OF POULTRY, POULTRY PRODUCTS AND VALUE IN 1957

The numbers of poultry in both Southern and Northern Rhodesia showed substantial increases in 1957, particularly in table poultry.

The numbers of poultry as at 30th September, 1957, with those as at the same time in 1956 in brackets, were as follows:—

Southern Rhodesia

Fowls, 713,226 (644,944); Ducks, 28,390 (26,563); Turkeys, 26,259 (24,045); Geese, 9,580 (3,371). Total: 777,455 (698,973).

The number of hen's eggs sold was 2,418,494 (2,147,525) dozen, valued at £387,829 (£367,999).

The number of day-old chicks sold, 779,907 (790,033) was slightly lower but the value the same, £65,461 (£65,313). Sales of other poultry for breeding numbered 74,847, valued at £16,567.

Table bird sales amounted to 1,131,964 lb. (802,140 in 1956 and 583,458 lb. in 1955), valued at £262,254 (£112,929 in 1956 and £81,864 in 1955), which indicates sales have more than doubled themselves in two years in numbers and trebled in value.

Northern Rhodesia

Fowls, 255,672 (240,471); Ducks, 7,544 (6,994); Turkeys, 5,506 (5,212); Geese, 903 (536). Total 269,265 (353,213).

Hen's eggs sold, 982,664, dozen (1,108,000 dozen) valued at £187,586 (£185,430).

Table birds sold, 236,447 lb. (181,000 lb.) valued at £44,282 (£33,266).

These figures do not reflect the exact numbers as the scope of the agricultural census does not include holdings of less than 25 acres, which excludes many poultry undertakings. These figures therefore are low.

It is of interest to note that the total value of poultry products sold by European farmers in the Federation on the above low basis amounted to £968,648, which compares more than favourably with the value of pig products (which includes considerable African production) for 1956 of £868,432. Poultry production can therefore claim to be of greater importance to the farmer's income than pigs.

POULTRY FEEDS

The supply of grains used in poultry feeds has been adequate, except that yellow maize was not available towards the end of the year. This is, however, not unusual.

Protein supplies of both animal and vegetable origin have to be imported in the form of fish meal and nut cake. It should be possible to produce full local requirements of nut cake and also lucerne meal.

The removal of the subsidy on maize in July had the immediate effect of an increase of five per cent. in the cost of poultry feeds which has been keenly felt by poultry producers, who are not able to raise prices to compensate, in the face of surplus production. The removal of the subsidy on small grains also denied them an alternative feed. Poultry feeds now constitute about seventy per cent. of the total costs of production of eggs and table birds, over which the producer has very little control.

The Federation of Rhodesia and Nyasaland Standards Association is now considering specifications for stock feeds and I have attended meetings when formulating requirements for poultry. It is anticipated this Association will be in a position to operate in respect of stock feeds by 1959.

The registration of poultry feeds has been carefully checked by this branch and the standard of feed now available may be considered as excellent.

GWEBI COLLEGE

Poultry Branch.—The Thirty-Eighth Annual Official Egg Laying Test concluded on January 30th, 1958. A full report was published in the March/April, 1958, issue of the Rhodesia Agricultural Journal. Results were comparable with previous tests, but mortality was above average. The commercial Section showed clearly the necessity for high producing stock and good viability in order to make egg production profitable.

The Thirty-Ninth Annual Test commenced on March 1st, 1958, and is showing improved results.

It was not possible to undertake any building construction this year due to lack of funds, but it was possible to extend piped and automatic water supply to all housing and also to rearing pens on the section, which will save labour.

Educational.—A lecture programme of thirty lectures on Poultry Husbandry was given to 48 first year students, and practical instruction continued throughout the year to all students.

A successful short course for Young Farmers' Club Leaders and Conservation Officers was held from August 31st to September 5th and attended by twenty people. Lectures, films, and demonstrations were given as well as practical instruction.

Stock.—The stock has been confined this year to two main breeds, New Hampshire and White Leghorn, in order to establish closed flocks for progeny testing which will require at least 500 pullets annually of each breed, which will occupy all available accommodation. A few other breeds are kept for educational purpose.

The breeds in question are of high quality through years of careful breeding, and further improvement can only be expected now by the adoption of full scale progeny testing.

The stock on hand at 30th August, 1958, was as follows:—

Hens and cockerels, 359 (breeding stock); hens and cockerels (6 months), 1,360; turkeys, 19; waterfowl, 39.

Revenue.—Sales of eggs to hostel, staff, and Salisbury Hospital amounted to 10,148 dozen and table poultry 8,451 lb., which together with Egg Laying Test fees and the sale of pedigree cockerels by auction, gave a total revenue of £2,547 17s. 6d.

MATOPOS RESEARCH STATION

The stock on this station comprises the New Hampshire Red and Light Sussex breeds which are being bred especially for an improved "broiler" type table bird which will be particularly suited to battery production.

In view of the very rapid expansion (300 per cent. in two years) of the broiler production in the Federation and the fact that there have been several commercial failures in raising them in batteries, this work is important.

In the specially constructed brooding and rearing houses for this work, up to date seventeen batches of 150 birds each have been raised to twelve weeks in the batteries without any decline in average body weight or any symptoms of

deficiency or respiratory diseases occurring. These results already indicate that this system of production can be successful. It remains to discover the ventilation, temperature, humidity, and space requirements at various stages of growth under local conditions in order that practical advice to producers can be given.

The selection for improved weight gains and body type in the breeding study should show some results next year but spectacular improvement cannot be expected for some years.

The rearing houses are nearing completion and four new laying houses will be completed next year. The building to house the Commercial Egg Laying Test birds to be run in conjunction with Bulawayo and District Poultry Association has been completed and provided the Association furnish the cages and make the final arrangements with feed manufacturers in regard to feed supplies, this Test should be able to commence next year. Departmental approval for the running of this Test was sanctioned during the year.

SPECIALIST EXTENSION AND ADVISORY SERVICES

The work of the branch on advisory services occupies the major portion of officers' time either in the form of visits to farms, interviews, meetings, or correspondence. Funds available for specialist extension work were inadequate but provided for a considerable amount of assistance being given to farmers in all areas of Southern Rhodesia. In Northern Rhodesia the Poultry/Dairy Officer has mainly concentrated on poultry extension work. The Chief Poultry Officer spent a week in the Lusaka area in Auust and will visit the Copperbelt later in the year, thus poultry farmers in that Territory will have received considerably more assistance than in the past.

VETERINARY

The Federation has again been free from any serious outbreak of scheduled poultry disease apart from small isolated cases of cholera and typhoid, which have been controlled. The testing of all breeding stock for typhoid and B.W.D. has continued, thus keeping these diseases well under control.

Respiratory disease particularly in broilers has caused losses and reduced gains. It would seem that as in other countries, chronic forms of Respiratory Disease (C.R.D.) become prevalent when broilers in large numbers are reared. Care in flock selection, breeding, and management, are the only means at present available in combating these diseases. A test for certain types has become available overseas and it is hoped it may be possible to employ it in the Federation. For this work and general poultry pathology, I have asked the Director of Veterinary Services to consider the appointment of an officer in his Research Branch to specialize in poultry diseases. There are now problems in the veterinary field which require the services of a full-time Poultry Pathologist and I wish to press for such a post to be created.

Some relaxation of the veterinary restrictions governing the importation of poultry and hatching eggs has been possible in respect of the Union of South Africa.

SHOWS

The Salisbury and District Poultry Club was the only one to hold a Young Bird Show, in March, this year, which was well supported. In addition this Club staged a Show with some 600 entries in August, which indicates added interest in this side of poultry keeping. Other shows were well supported in most cases and that at Fort Victoria was of special interest in the excellent exhibits of indigenous poultry shown. Poultry officers judged at the various shows in the Federation and poultry exhibits were featured in the Departmental Halls at Salisbury and Bulawayo shows.

As indicated, Poultry Clubs and Associations are taking a greater interest in commercial problems through the R.N.F.U. organization.

STAFF

The Poultry Officer for Matabeleland at Matopos Research Station, following a major operation, was on sick leave for three months during the year. His health is now satisfactory. During his absence, the Technical Assitant, Mr. Kemp, managed the stock at Matopos very well.

The Lecturer in Poultry at Gwebi, Mr. McKinney, resigned in January in order to study at Natal University for a B.Sc. degree. The vacancy was filled by Mr. Lloyd, who held the post previously. He was re-appointed on May 1st.

The Poultry/Dairy Officer in Northern Rhodesia, stationed at Lusaka, who is on secondment, has concentrated more on poultry work this year.

I wish to acknowledge the efficient services of Miss Lawrence at Headquarters office.

GATOOMA RESEARCH STATION

A. H. McKINSTRY
OFFICER-IN-CHARGE

RAINFALL

The total rainfall for the season, October, 1957, to April, 1958, inclusive, at the "Laboratory" gauge, the official rain-gauge of the Meteorological Department, was 32.39 inches. Rainfall totals at the "Laboratory", "Bagley", and "West End" gauges were all similar. The three gauges are approximately equidistant from each other by about 1.50 to 1.75 miles, the area of the Station being L-shaped.

Rainfall distribution was poor. The main features of the distribution may be summarized as follows.

To begin with, a late, erratic and difficult start in November and December, 1957. Of the total of 1.96 inches recorded in November, 1.09 inches fell in one storm on the 19th. Following on this, it was not until the second week in December that a total of 2.52 inches was recorded in a number of showers, after which further showers amounting to "just over the inch" fell during Christmas week.

Secondly, a wet mid-season, during which 10.87 inches fell in January and a further 10.14 inches in February, 1958. The mean daily hours of sunshine in these months was low, particularly in February, for which the mean was only 3.3 hours per day.

And lastly, an early and rather abrupt "shut down" on the 3rd of March with falls amounting to 1.60 inches over the first three days of the month.

Rainfall and sunshine records are shown in the following table:—

RAINFALL AND SUNSHINE RECORDS

FOR THE PERIOD OCTOBER, 1957 TO APRIL, 1958 INCLUSIVE

Figures in brackets are for 1956/57

Month	*Total Rainfall (inches)*	*Rainless days (Omitting traces of rain)*	*Longest period without rain*	*Mean sunshine hours per day*
October, 1957 . . .	2·94 (0·54)	24	15	7·7 (9·9)
November, 1957 . .	1·96 (4·30)	23	14	7·5 (4·8)
December, 1957 . .	3·69 (6·08)	18	10	6·2 (5·5)
January, 1958 . . .	10·87 (6·99)	6	2	4·9 (7·5)
February, 1958 . . .	10·14 (4·88)	5	2	3·3 (7·3)
March, 1958 . . .	1·60 (2·95)	28	28	9·3 (8·3)
April, 1958	1·19 (0·88)	24	13	8·5 (9·5)
	32·39 (26·62)			

COTTON YIELDS AT GATOOMA

The great importance of early planting and germination, rainfall permitting, or alternatively of dry-planting, provided a suitable seed-bed can be prepared, was once again reflected in the yields obtained.

For example:—

lb. seed cotton per ac

Good soil fertility + Insecticide treatment

1. Cotton, hand-planted in dry soil and germinated by the 25th November following 1.09 ins. of rain on 19th November ... ... 950 lb.
2. Cotton hand-planted, in which germination was delayed until the 12th December, i.e. about 17 days later than 1 above ... ... 550 lb.

Next the importance of soil fertility may be emphasized:

3. Cotton planted in soil of poorer fertility than 1 and 2, but which germinated by the first week of December and which was treated with insecticide ... ... 410 lb.

Finally the importance of insecticide treatment may be stressed:

4. Cotton not treated with insecticide, but which was planted in soil of good fertility and which germinated by the first week of December ... 183 lb.

COTTON PLANT BREEDING

General

Cotton plant breeding is conducted for the rain-grown crop, and also for the irrigated crop of the Sabi Valley, at Gatooma. Future results from a full range of different strain trials, planted annually at Gatooma and at the Sabi Valley Experiment Station, will decide whether the work should be organized on a different basis.

As part of the plant breeding programme strain trials are planted at about a dozen different localities in Southern Rhodesia and, starting with the 1958-59 season, there will also be five trials in Northern Rhodesia. Two of the latter will be in the Fort Jameson area; and one half of the number of strains planted in these two trials will be supplied from Gatooma while the remaining strains will be supplied from the Empire Cotton Growing Corporation Station at Makanga, in Nyasaland.

Insecticide treatment. Plant breeding plots and trials, which occupied approximately 14 acres at Gatooma in 1957-58, received ten applications of the insecticide Endrin over the period mid-January to the end of March, 1958. Pests, with the exception of a late attack of American bollworm, referred to later, were kept under reasonable control and, because of this fact, yield comparisons between strains in different trials and bulks have been facilitated.

Insecticide was also applied to the District Variety and Small Bulks trials planted at different localities. The treatment was productive of satisfactory yield results, especially where trials were planted early and soil fertility was uniformly good.

However, as cotton growers do not yet apply insecticide to their crops as a general rule, bulks of three strains, which have proved promising in a number of characters, were planted at the Station in an area in which cotton was not treated with insecticide. The untreated bulks were approximately 1.5 miles distant, as the crow flies, from the treated cotton. This arrangement permitted useful observations to be made on the effects of jassid and bollworm attack in the untreated bulks.

Bacterial Blight. Attempts were made artificially to infect appropriate plant breeding material with bacterial blight, by inoculating bolls by the "needle prick method", in March. While the wet-weather conditions which prevailed in January and February had been conducive to the spread of natural infection, boll inoculation, done in March this season, coincided with the cessation of the main rains, after which conditions were too dry for the development of the disease. Consequently, selection for resistance to bacterial blight was based, as far as possible, on natural infection.

The inoculum with which bolls were treated was cultured by the Division of Botany and Plant Pathology.

Cotton Selection and Crosses

Bacterial Blight. Progress is being made in backcrossing and selecting for bacterial blight resistance, as well as jassid resistance and other desirable characters, in the following plant breeding material:—

(1) Progenies of selections from different Albar 51 strains, particularly Albar 637.

(2) Progenies of crosses between Albar 51 strains and strains derived from the cross MU8A x BP52[2]. In the interests of brevity these selections are termed the BMA strains.

(3) Progenies of crosses between certain lines of BP52, which carry the B_2B_6 resistance genes, obtained from the Sudan, and MU8A, or Albar 51, or G52/36.

(4) Progenies of crosses between BAR 4/18 *G. barbadense,* carrying B_2B_6 and *G. hirsutum* varieties.

Referring to Albar 637, this strain has consistently given promising yields over a number of seasons and although variable for jassid resistance, the strain has a high yield potential, high resistance to bacterial blight, and lint of better quality than strains derived from U4. Seed immaturity in Albar 637, which became apparent for the first time this season, may be an obstacle. However, initial bulking of Albar 637 seed took place during the season, and the strain

has been included in the District Variety Trials in 1958-59. It is of interest to note that Albar 637 is being multiplied in Nyasaland, to replace CLB as the commercial variety.

Regarding the BMA strains, a number of these were tested in the Progeny Trials at Gatooma and Sabi, and certain ones have been taken forward to the Small Bulk trials in 1958-59.

The progenies mentioned above under (3) and (4) have not yet reached the stage at which report can be made.

U4 Strains. The volume of selection work within U4 strains will probably be carried out on a decreasing scale in future. While it is comparatively easy to maintain high yield levels, it seems not unlikely that marked improvement in lint quality will not be obtained within the U4 group of strains. The lint of U4 strains, characterized as being harsh and inclined to weakness is apparently not fully acceptable for "straight-run" spinning in the Cotton Industries Board's mills at Gatooma. Moreover, the bacterial blight resistance of U4 material is in no instance as inherently high as it is in the Albars and some of the other strains and varieties to which reference has been made.

In 1957-58, G52/36, a selection from the commercially-grown 9L34, and a direct descendant of U4, came up to full expectations as far as yield and agronomic characters were concerned. The strain was not outyielded by a significant amount in any of eight of the District Variety Trials which had been received for analysis at the time that this report was written. Six of the trials, which were rain-grown, gave a mean yield of 335 lb. of clean *lint* per acre, while in the remaining two trials, planted under irrigation, the mean yield of the strain was 565 lb. of clean *lint* per acre.

Again, the yield of G52/36, grown under irrigation in a 100 acre bulk at an Estate in the Sabi Valley is reported to have been approximately 1,000 lb. of lint per acre which is roughly equivalent to 3,000 lb. seed cotton per acre.

However, despite the fact that earlier tests on small quantities of lint had indicated that G52/36 was not inferior to 9L34 in spinning performance, bulk and further laboratory tests conducted at the Cotton Industries Board's mills at Gatooma in 1958 indicated that the lint of this strain lacked maturity. Therefore, after consultation with the Board, it has been decided not to issue G52/36 to growers.

There is, at present, a fair number of U4 strains in the different plant breeding trials. Some of the strains are promising for yield, but a critical examination of lint quality will be made now that facilities for this work have been increased.

COTTON INSECT PESTS CONTROL

The following conclusions are taken from the Abridged Report for the 1957-58 season, written by the Entomologists engaged on cotton pests research.

The period of *Diparopsis* moth emergence extends over the entire cotton growing season, with, this season, a peak emergence in January-February. *Diparopsis* eggs are laid on all parts of the plant, and there is a cosniderable loss due to unknown causes. With a suggested maximum number of four generations of the pest during the season, the period over which control measures must be applied to the crop may be considerable.

It has been shown by trials carried out over the last two seasons that the most promising method, at present, for increasing cotton yields is by spraying regularly, over a period of about two months during flowering, with Endrin. The need for a high potential yield per acre, however, is essential for this control method to be both effective and economic. For this to be attained, sound agronomic practices including early sowing, thinning, and weeding, good plant stands, and a high level of soil fertility are all of paramount importance.

Previous season's insecticides trials had been mainly concerned with *Diparopsis*. This season infestations of *Diparopsis* were relatively low but there was a very heavy attack of *Heliothis*, which applications of Endrin failed to control. Further investigations into the chemical control of *Heliothis* are required, and these will be commenced in 1958-59. In this connection, however, it has long been established that the loss in yield as a result of *Heliothis* attack can be considerably reduced by early sowing and sound agronomic practices.

A Farm Scale Insecticide Trial, the component parts of which were situated on several farms in the Gatooma-Hartley district, has yielded considerable

agronomic and entomological data, the value of which will increase with the continuation of the trial over a number of seasons. In another trial drift spraying over several rows of cotton was carried out, but this method was shown to be not so effective in increasing yield as spraying each row individually. In yet another trial, Sevin was used for the first time, and on the result of yield figures only, this insecticide would appear to be promising.

Generally, however, the results of the insecticides trials were inconclusive and this was often due to both climatic and agronomic factors retarding plant development.

It has been confirmed that proportionally more *Diparopsis* overwintering pupae are produced during the latter part of the season, and it has been shown that a certain proportion of pupae carry over for more than one season. This latter fact is of great importance, especially where an alternate-year cotton policy is to be carried out. Further data obtained, over several seasons and for different areas, however, is required for a full appreciation of the importance of this carry-over.

Pupae were formed principally within the top three inches of soil, evenly distributed under the plants.

Considerable pupal mortality was evident in the field. The ant, *Dorylus (Alaopone) conradti* Em. has previously been shown to be a pupal predator, but further study is required to determine its importance, and the identity of other possible predators.

Various cultivation treatments, both mechanical and hand methods, have been shown not to affect materially the survival of *Diparopsis* pupae.

Cotton Stainers, *Dysdercus* spp., were not a problem in 1958-59 in cotton which had been treated with insecticides.

AGRONOMY

Detailed work on cotton fertilizer and other agronomy experiments was held in abeyance during the 1957-58 season.

Mr. P. E. L. Thomas, Professional Officer, who had taken over the experiments in January, 1957, left Gatooma on transfer in October, 1957. Mr. H. J. A. van Lindert, Technical Assistant, who arrived at Gatooma, on first appointment in November, 1957, carried on the maize stubble mulch trial, continued observations in the pigeon pea (dhal) collection plots, and started observations and limited selection work in a small number of Kenaf strains. Also included in Mr. van Lindert's programme of work was the regular application of insecticidal sprays in the cotton plant breeding trials and plots, and in the several field trials conducted by the research entomologists.

"Land Capability". The Land Capability Map of the Station, prepared by officers of the Conservation and Extension Department in 1958, indicates that out of a total of 874 acres, 386 acres (or 44 per cent.) are classified as Class III land, and 285 acres (or 33 per cent.) are Class IV land.

In the description applicable to the land classification, it is advised that Class III is "suitable for cropping only with elaborate protection or for short periods in rotation with long leys", and that Class IV land "should be kept mainly under perennial vegetation with only occasional limited and careful cropping". Nevertheless, it is well-known that the major cultivation hazard in the lands in question, which include the bulk of the experimental fields of the Station, is waterlogging, which occurs most markedly during seasons of high rainfall, and especially when there is an unbroken sequence of such seasons. The cause of the waterlogging is a body of semi-impervious, partially decomposed, rock, lying about four feet under the surface of the land. An effective remedy against the water-logging at the Station, and also on farms in the district, is obtained by ploughing drainage or finishing furrows approximately 50 to 70 feet apart on a mean contour of 1 in 300. During ploughing, slightly raised, broad-based beds are formed between the furrows.

The usual three-year crop rotation in the Station's lands, several of which have been under continuous cropping since the late 1920's is: maize, leguminous green manure, cotton.

Maize Stubble Mulch Trial. The fifty-four plots of this trial occupy an area of 7.44 acres. The trial, started in 1955-56, is designed to assess the effect of stubble mulching, trash ploughed under, and trash removed prior to ploughing

(clean ploughing) on yield, and on the incidence of Helminthosporium, various cob rots, insect damage to the cobs, and of maize stalk borer.

Each of the three cultivation treatments received applications of 0 lb., 200 lb., and 400 lb. of Sulphate of Ammonia per acre; half of the fertilizer was applied at planting and half when the maize plants were knee high.

In addition to the Sulphate of Ammonia, all plots received, uniformly, an application of 100 lb. Superphosphate and 50 lb. Muriate of Potash per acre before planting.

Grain yields in terms of bags (200 lb.) per acre for the three seasons are given in the following table:—

Treatments		Grain yields as Bags per acre		
		1957/58	1956/57	1955/56
Clean	N_0	8·8	5·2	9·9
	N_1	15·3	12·0	15·6
	N_2	17·6	16·7	18·4
	Means	13·9	11·3	14·6
Trash	N_0	8·5	4·6	8·0
	N_1	14·4	11·0	12·6
	N_2	16·3	14·9	16·3
	Means	13·1	10·2	12·3
Stubble	N_0	6·0	4·6	6·2
	N_1	12·0	10·5	12·6
	N_2	15·1	13·9	12·6
	Means	11·0	9·7	10·5

While a statistical analysis of the 1957-58 yields is not available at the time of writing, the trend of results appears to be similar to that obtained in the previous two seasons. Thus "clean" plots gave higher yields than either "trash" or "stubble" plots, while there was only a small difference in yield between the "clean" and "trash" treatments. Furthermore, greater yield responses were obtained from applications of Sulphate of Ammonia than from the three cultivation treatments.

As in the two previous seasons, the small incidence of Helminthosporium, precluded an assessment of differences between treatments.

The main results, obtained from an examination of samples of 200 unshelled cobs harvested from 200 plants per plot, were:—

1. With increasing amounts of nitrogen there were statistically significant decreases in the incidence of *Diplodia zeae* in each of the cultivation treatments. However, the incidence of the disease in the stubble plots was significantly double that observed in the clean plots, with intermediate results from the trash plots.

2. Insect damage (including borer) to the cobs increased significantly with the increases in the amounts of nitrogen applied, for each cultivation treatment. Differences between the types of cultivation, however, were not significant.

Again, stalk borer damage, in the stalks of the 200 fully mature plants, increased significantly with each increase in the amount of nitrogen applied in the form of Sulphate of Ammonia.

The foregoing results, derived from the examination of maize cobs and plants, were obtained in consultation with the Officer-in-Charge Seed Services and the Biometrician's office.

Pigeon Peas or Dhal: Cajanus cajan. There were two series of observation plots of this legume in 1957-58. One series consisted of standover plants in the 181 plots which were sown with seed during the period November, 1956 to February, 1957. The seed was obtained, as a result of enquiry, from many countries, in 1956.

Observations on the growth and survival of plants in the 181 plots, at the end of September, 1958, or after two "rainfall" and two "dry" seasons, revealed that in 17 per cent. of the plots all plants were dead while in ten per cent. of the plots plants not only showed practically no signs of die-back, but there was also a fair amount of healthy new growth. These desirable characters exist in association

with differences in plant height and in the time taken from germination to flowering. Plants in the remaining plots exhibited varying amounts of die-back and new growth.

The second series of pigeon pea observations plots were sown in December, 1957 with seed harvested from the 1956-57 plots, the collection of strains having first been grouped on the basis of height, vigour of growth and time of flowering. Similar observations on height, etc., were made in these plots during the 1957-58 season.

Seed of practically all pigeon pea introductions has been sent to the majority of the Research Stations, to the two Pasture sub-Stations and, in certain instances, to the Conservation and Extension and Native Agriculture Departments. Seed has also been sent to Nyasaland and to Kenya.

Kenaf: Hibiscus cannabinus. Preliminary observations on plant development were started; and single plants were selected, in a limited number of varieties, seed of which was obtained from Salisbury Station and from Messrs. Rhodesian Jute Industries, Umtali.

Only one variety, namely "Cuba" ex-Salisbury (NK 57/2), was sufficiently uniform for plant type and vigour of growth to merit further attention as a variety. A limited quantity of selfed seed has been obtained, and this will be bulked in isolation in 1958-59.

Seed of a wide range of varieties, predominantly *H. cannabinus* but with some *H. sabdariffa* vars., has been obtained, for planting in 1958-59, from different countries, including South Africa, India, Formosa, Russia, and the United States of America.

Of particular interest, as far as can be judged at present, are a number of strains obtained from the Belle Glade Station, Florida, which are described as being resistant to known races of *Colletotrichum hibisci*. There are also, from the same station, two selections from the cross between *H. cannabinus* (2n=36) and *H. eetveldianus* (2n=72), the chromosomes of the sterile hybrid having first been doubled by treatment with colchicine. *H. eetveldianus*, an ornamental hibiscus is highly resistant to nematode. Although there is no certainty that a variety with high nemaode resistance will be evolved from the cross, it is gratifying to have procured the necessary plant breeding material for trial.

In addition to the plant breeding material mentioned, trials which include spacing and NPK fertilizer treatments, and possibly also time of planting treatments, will be planted in 1958-59.

CROP TRIALS FOR OTHER STATIONS

The trials listed below were planted, maintained, and harvested at Gatooma, on behalf of professional officers who are responsible for the main experimental work on the different crops, as indicated, at other Research Stations.

The trials are conducted at Gatooma mainly to increase information on the range of crops which may be suitable for the medium rainfall areas, as typified by the Gatooma-Hartley districts. It is very necessary in field investigational work that variety and other trials relating to different crops should be grown in as many likely ecological areas as possible.

In 1957-58 the trials, grown at Gatooma, were:—

1. Maize populations/fertilizers for Salisbury.
2. White Maize varieties for Salisbury.
3. Wheat varieties for Salisbury.
4. White and Yellow Maize varieties for Matopos.
5. Castor Bean varieties/fertilizers for Matopos.

The Federal Maize populations/fertilizers trial for Salisbury has since been discontinued. Details of treatments assigned to the different trials, and analyses of the yield results, are for report by the officers concerned.

GWEBI AGRICULTURAL COLLEGE

DR. W. L. FIELDING
PRINCIPAL

INTRODUCTION

The professional and instructional staff are generally engaged in education, development, production and research. That is to say, whilst they are continuously engaged in lecturing, giving demonstrations and practical instruction, each officer is intimately concerned, in his own sphere, with development, practical farming operations leading to production, and research. The administrative office staff is fully engaged with general office routine, timetables, student mark sheets, organization of student affairs, operation of the General Purposes Fund, the technical library, and so on. At the Hostel the Warden and Matrons are responsible for the residential sphere of student life, health, social events and sport. The Warden is also responsible for the residential area grounds, playing fields, swimming bath, squash court, and other amenities.

EDUCATION

Course No. 8 passed out of the College in July, 1958. The standard of work was high, the results including nine First Class Diplomas, carrying twelve Distinctions, and twelve standard Diplomas carrying two Distinctions. There is no doubt that the introduction of First Class Diplomas last year has acted as an incentive to do outstanding work. Since the college opened 80 per cent. of the students who have sat the Final First Year Examinations have qualified for the Second Year of the Diploma Course, but this year Course No. 9 produced 90 per cent. passes, 30 students going forward to give us the largest Second Year in the history of the College. It seems that there is a growing tradition of application to work. It is satisfactory to have a high percentage of Passes into Second Year, but it will be interesting to observe the adequacy or otherwise of instructional facilities.

Diploma Day was held on 16th October, 1957, when Professor Sir Frank Engledow, C.M.G., M.A., F.R.S., Draper's Professor of Agriculture in the University of Cambridge, was the Guest of Honour. During the ceremony a Scroll of Greeting was presented to Sir Frank, on behalf of the College, by the Student Association Chairman. It had been hoped that guests would visit various parts of the College and College farm after the ceremony, but, surprisingly for mid-October, a deluge of rain occurred (as happened last year when the ceremony was held in December) and once again guests could not go round.

During the August/September vacation a party of students volunteered to help show the College livestock at various shows throughout the country. This was of distinct educational value for them, and farmers everywhere commented on the students' keen stockmanship.

A development in the Engineering Section has been the overhaul of tractors supplied by farmers. Each student practical group is required to perform a complete overhaul of a tractor in the second year. The difficulty has been to obtain adequate material, and the stripping and re-assembling of obsolete machines has had to suffice in the past. The new idea, suggested by a past Chairman of the Student Association, means first class experience on reasonably up-to-date machines. The farmer supplies any spares and replacements which are found to be required. When the machine is returned to him he is given a complete report on horsepower tests and so on made on the tractor.

A most important educational development has been the installation of engine-testing apparatus at the workshops. With the aid of this equipment students can study engine efficiency as affected by various faults and their correction.

Technical drawing has been considerably developed in both First and Second year work in the Building Construction workshop. In the Second Year a student prepares a complete plan of a farmyard, with full constructional details and costings of each building or installation. These plans are described and criticized at a Seminar held at the end of the College year.

A very high standard of work in welding and fitting was demonstrated in the practical examinations.

Farm Planning instruction has been expanded and now absorbs 15 out of the 30 lectures given to Second Year students on Conservation. There are also,

of course, field demonstrations and practicals in connection with planning, whilst the siting and design of buildings, water supply schemes and so on, mentioned in the last paragraph but one are based on requirements as determined by the Farm Plan.

Instruction in tobacco culture has considerably improved, even though there are no facilities for practical tobacco instruction at Gwebi. A very thorough series of lectures is now given on this crop by a member of the College staff who has made an intensive study of tobacco and had practical experience of growing it. Constant use is made of the facilities at Kutsaga, which Second Year students freqently visit in the growing season, receiving detailed instruction in the field from the Officer-in-charge and other members of the Kutsaga staff. Visits are also made to successful growers, to see field, barn and grading procedure, and to the Tobacco Sales floors and packers.

The number of lectures allocated to the Chief Fisheries Officer has also been increased, and students are taken to Henderson Research Station for detailed demonstrations of fish culture.

The Lecturer who deals with Poultry instruction is now a member of the Animal Husbandry Section of the College, and being an officer with all-round training in agriculture, is able to play his part in certain spheres of general Animal Husbandry instruction, such as Veterinary Science and Genetics applied to animal breeding. This is a very useful development as the Section formerly carried only one Lecturer, which meant a cessation of instruction in this subject if he was away or ill.

"Outdoor teaching" has been generally intensified. Apart from day visits to farms and Research Stations, a Short Tour of four days was undertaken to Grasslands Research Station and sandveld farms of various types south of Marandellas. The Main Tour was undertaken in the Sinoia, Karoi and Lusaka areas, this being the first time the College has made an organised visit to Northern Rhodesia.

Apart from journeys with the students, staff travelled widely during the year. The Principal attended, as a Federal delegate, the C.C.T.A. Conference on Industrial, Commercial and Agricultural Education (south of the Sahara) held in Brazzaville, Leopoldville and Luanda, and was co-rapporteur (English) of the Agricultural Committee, with a representative of France. This experience was not only generally broadening, agriculturally and educationally, but particularly instructive where planning for the establishment of a College of Agriculture for Africans in the Federation is concerned. The Senior Lecturer in Field Husbandry and an Assistant Lecturer attended the Chemical Weed Control Conference at Victoria Falls. The Assistant Lecturer read a paper, based on work done at Gwebi, in conjunction with a Research Officer of Fisons Pest Control, Ltd., and the experience and information gained will be generally useful in our teaching. The Senior Lecturer in Animal Husbandry attended a Friesland Course at Marandellas, and qualified as a judge of the breed. The Senior Lecturer in Engineering has served on the Federal Ministry's Engineering Research Committee where again much information useful in teaching, as well as research, has been acquired.

DEVELOPMENT

There cannot be much development under the prevailing conditions of financial stringency. Nevertheless, a certain amount, entailing only small expenditure, has been going on.

Field Husbandry

On Mundy field, where agronomy research is carried out, the "Range System" has now been applied to the whole experimental area, which has now been completely surrounded with a vermin and thief proof fence, whilst a badly needed field store has been provided very cheaply by the Engineering Section (Building).

The layout of the N.E. corner of Broadbalk field has now been settled and greater emphasis on irrigation and orchard management will now be made in

this area in First Year student practical work. It is now routine to have all lands planted to maize analysed by the Chemistry Branch; reports reveal a drop in pH, presumably due to sulphate of ammonia applications, and a consequent development is a liming programme.

The re-planning of Gwebi South will enable us to demonstrate "continuous maize," alternate green manure/maize, and 4-years grass/3 years crops systems of farming. The introduction of the animal factor into the latter system, together with the greater utilization of Acton meadow, has been planned.

Because of the remoteness of Morgan and Rifle Range fields, and the surrounding veld (430 acres in all), and since it is not anticipated that the College will require this area in the foreseeable future, arrangements have been made to transfer all of it to the Veterinary Department, which already has a field Research Station on some nearby ground. No further land south of the main road can be made available to any other Department without seriously interfering with student education and the College farm generally.

Work on the general development of veld and planted pastures, for the provision of flush-season and foggage grazing, hay and silage, continues, together with the necessary fencing and water supplies.

A general clean-up of the Farmyard area has taken place, a major operation being the felling and clearing of dangerous Eucalypts. C.M.E.D. have replaced various old tractors and added some items of equipment. The range and type of equipment now possessed by the College can be regarded as reasonably satisfactory for student instruction and our work generally. If financial stringency continues, however, our work may be seriously embarrassed through failure to replace certain very old, but essential items of College farm-owned equipment, which, through age, are suffering from metal fatigue.

The College Herbarium, Geological Museum and Technical Library have each gone a stage further during the year. The College Laboratory has carried out various analyses, and the most important development is the study of the better utilization of legumes grown as fodder.

Animal Husbandry

The buildings required by this Section are reasonably adequate, but a new office and an extension of the cattle pens are required when funds become available.

A young Hereford bull has been imported from England, and it is hoped that he will help to improve the general standard of what is already a good herd.

A young Blackhead Persian Ram was presented to the College by the South African Blackhead Persian Sheep Breeders' Association, and will be useful in furthering our efforts to raise the standard of the College flock.

Engineering and Building Construction

An extension to the new workshop was completed, providing an engine testing and demonstration room, engine overhaul room, equipment stores and tractor shed. This will result in a great improvement in mechanical instruction.

A squash court (financed by the College General Purposes Fund) was completed.

A novel type of rotary mower was constructed in the College workshops.

PRODUCTION

Rainfall, 35.26 inches, was above the forty-year mean of 31.96 inches. 3.24 inches of this fell in mid-October, and apart from the fact that it made early seed-bed preparation possible, could not have contributed markedly to production. 6.99 inches fell in November, some of it early in the month, so that the College got off to an earlier start with planting than many parts of the country. There was no effective fall after the 5th March, 1958, however, and the maize crop had a high proportion of shrivelled grain with yields being over four bags/acre lower than estimated in February.

Field production included:—

Crop	Acres	Production	Yield/acre
Maize grain (Broadbalk)	66·0	1,351 bags	20·47 bags
Maize grain (Gwebi South)	194·0	3,195 bags	16·47 bags
Maize grain (Experiments)	—	166 bags	—
Maize velvet bean silage	31·0	550·5 tons	17·75 tons
Sunflower (seed)	9·7	65·5 bags	6·75 bags
Groundnuts (unshelled)	12·5	169·5 bags	13·56 bags
Potatoes (Experiments only)	—	38·0 bags	—
Velvet bean seed	12·0	117·5 bags	9·79 bags
Soya bean seed	22·0	49·0 bags	2·23 bags
Ration beans	3·7	15·0 bags	4·05 bags
Dolichos bean hay (estimated)	12·0	18·0 tons	1·50 tons
Velvet bean hay	11·0	22·0 tons	2·00 tons
Soya bean hay	50·0	26·0 tons	0·52 tons
Sudan grass silage (Acton pit)	—	55·0 tons (estimated)	—
Maize silage (Acton pit)	—	55·0 tons (estimated)	—
Veld hay (part fertilized)	22·0	55·0 tons	2·50 tons

It is noteworthy that the yield of maize obtained in Gwebi South is the highest yet obtained; the College opened in 1950 and the records of the seasons 1944/45 to 1951/52 reveal an average yield of only 8.83 bags in those days. The yield of 17.75 tons/acre of maize-velvet bean silage was again obtained, and is particularly satisfactory. The season was a poor one for soya beans which got "wet feet" in January and only produced 0.52 tons/acre of hay, whereas the expectancy at Gwebi is nearer 2 tons/acre. The yield of veld hay (part fertilized) is particularly high.

The College Friesland herd went through a period of infertility due to Vibrio Foetus, but, following the re-introduction of A.I from the College bulls, the position has improved and a large percentage of animals is again in calf.

The Federal Annual Milk and Butterfat Competitions reveal the following position as far as the College Friesland herd is concerned:—

Year	*Milk*	*Position*	*Butterfat*	*Position*
1953/54	10,063·0 lb.	20th	338·31 lb.	28th
1954/55	11,265·0 lb.	14th	389·94 lb.	16th
1955/56	11,993·0 lb.	5th	431·22 lb.	6th

This Competition is based on the top 15 animals in each herd, which means, in a small herd such as that at the College, half the milking herd is involved.

Pedigree Cow F16, bred by Murray Bros., in the Union of South Africa, established a new butterfat record for the College during the year, producing 569.23 lb. butterfat in a 300-day lactation, showing something of the quality introduced to the herd by purchasing animals in the last few years. The performance of the College Friesland and Hereford herds at several agricultural shows also proves the high quality which is being built up.

Over 10,000 dozen eggs and 8,000 lb. table poultry were produced, and the annual sale of pedigree cockerels brought good prices. Pekin drakes and ducks, turkey toms and hens, were sold out of hand during the year, but demand for turkeys was poor.

RESEARCH

Research at the College cannot be expanded in any way unless the staff, particularly in Engineering, is expanded. However, a certain amount of research had continued, where educational and practical farming duties have permitted.

Field Husbandry

Federal Maize Trial. The variables were plant populations, nitrogen, phosphate and potash. Increasing the population from 12,900 plants/acre to 14,520, increased yield. A further increase to 16,900 decreased yield to the level of that obtained from the 12,900 population. Nitrogen had a marked effect. 250 lb./acre ammonium sulphate increased yield by 9.44 bags/acre. Adding a further 250 lb./acre gave a further increase of only 2.36 bags/acre. A small phosphate application of 125 lb./acre was slightly effective. Potash did not affect the yield.

Maize Varieties. Commercial hybrids 1 and 8 performed poorly, and were attacked badly by *Helminthosporium Turcicum*, and were out-yielded by Southern Cross. Some experimental 3-way crosses showed great promise, showing less

H. Turcicum damage, and the best of them, 55 3/W H 72, out-yielded S.R. Hybrid No. 1 by over 10 bags/acre.

Maize After Grass. Two experiments were planted after a 4-year star grass ley which had been grazed in summer by cattle and moderately fertilized with nitrogen and phosphate. The soil was hard to plough but broke down into excellent tilth when disced after rain. In one experiment, where 600 lbs./acre of ammonium sulphate was applied, maximum yields of over 30 bags/acre were obtained, *regardless of time of application.* Phosphate had only a small effect. In the the other experiment nitrogen was again effective, differences due to time of ploughing did not appear; subsoiling had no significant effect, indicating that although summer grazing may compact surface soil, it had no undesirable effect below ploughing depth in this case.

Potatoes. Various potato varieties were again tested out for yield and blight resistance. In a critical experiment, Furore, Gineke, Voran and Dutch Robyjin yielded from 97 to 115 bags/acre. Pimpernel was disappointing, giving only 88 bags/acre. All these varieties were quite resistant to Late Blight. Although the latter was not very severe until late January, this experiment, together with a fungicide spraying experiment, gives hope of once again being able to regard the potato as a useful cash crop in arable rotations

Soyabeans. The College regards soyabean as a useful crop for hay and a wide range of hay strains, imported from the Union of South Africa, were tested out. They did not, however, seem suited to our conditions, and all compared unfavourably with the best Rhodesian strain, H 147, which gave 1.97 tons/acre of hay at 19.0 per cent. C.P.

Castor Beans. These do not show promise as a commercial crop in this area at the moment, due largely to disease damage.

Wheat. In an experiment to test various methods of chemical weed control against hand cleaning, summer wheat did not give satisfactory yields and further doubt is cast on the possibility of this crop becoming of commercial importance under raingrown conditions.

Pastures. The Fertilizer/Grazing trial on topland veld produced results generally better than the mean of the previous four years. Useful botanical analyses were carried out, revealing an increase in *Sporobolus Pyramidalis* in all fertilized paddocks though in the N_3PK paddocks the original common species seemed little changed. Soil analyses show an increase in acidity in all fertilized paddocks.

Animal Husbandry

Economical Beef Production. Four groups of six steers each, Mashona, Hereford, Sussex, Tuli (Golden Dun), are running in a comparative trial, the object of which is to produce reasonable quality beef as economically as possible. This is the third such trial. If these trials are continued over a long period of time, the degrees of freedom will be such that critical figures will become available even though the number of animals involved in individual trials is small. Economic winter supplementary feed, in the form of urea and molasses sprayed on hay from fertilized veld paddocks has been used. Several alternative methods of winter feeding are under investigation, using other groups of animals.

Owing to a change of staff and lack of funds little progress was made with poultry research.

Engineering

The main work in progress has been the collection of information from various countries, and the development of pilot projects in connection with the study of power. These include studies of Producer Gas, Methane Gas, electrically propelled vehicles, and solar energy for crop drying.

PUBLICATIONS

The Principal continued to serve as a member of the Editorial Board of the Empire Journal of Experimental Agriculture, and published a paper in the 25th anniversary number of that journal; "Trends of Agricultural Thought and Research in the Federation of Rhodesia and Nyasaland in the last twenty-five years." A feature of the paper is a comprehensive bibliography which should provide a useful guide to research workers interested in the Federation.

GRASSLANDS RESEARCH STATION

H. D. L. CORBY,
OFFICER-IN-CHARGE

The Grasslands Research Station, at Marandellas, serves the agriculture of some 12½ million acres of sandy country in north-eastern Southern Rhodesia, where rainfall is usually sufficient, and sufficiently reliable, for arable farming without irrigation.

Within its means, the Station deals with all aspects of the agriculture of its region except tobacco, and there it works by offering its facilities and co-operation to the Tobacco Research Board.

As its main task the Station is seeking means of maintaining and raising soil productivity. It is believed that the sandy soils of the region, once brought into cultivation, can best be preserved for continuing agricultural use by alternating the crops with grass and grass-legume leys, and much of the work of the Station derives from this belief. At present, however, most of the arable land is still virgin, and provides some of the best natural grazing in the country; some study, therefore, is made of the management of natural grassland. There is some work, too, with irrigation, and with vlei land, to provide green feed for the long dry winters.

WEATHER

The rainy season was short, wet and cool, and most crops and some experiments suffered. The main rains started late, on November 29th, and finished early, on March 3rd. Despite this, rainfall for the season, from July 1st, 1957, to June 30th, 1958, was 40.38 inches—3.98 inches more than the average for the past twenty-four years. The average amount of sunshine during December, January and February was only 4.8 hours daily. The winter was generally mild, with ground frosts on fifty days.

WORK WITH GRASSES

Grasses, as the basis of the Station's work with leys, continue to be much studied.

The "Sabi" selection of *Panicum maximum*, the latest of Dr. West's grasses to be tried on a field scale, continues to do well. It seeds freely, is easily established, is productive and palatable, and is said to be "eel-worm resistant."

In the nursery, attempts to secure a strain of *Panicum coloratum* which both sets viable seed and has the creeping habit are encouraging—a few viable seeds have been obtained, and plants grown from them have the creeping habit.

Seven of the better grass selection are being compared for yield and for response to nitrogenous fertilizer. As was the case last season, much of the difference between grasses lay in their responsiveness to nitrogenous fertilizer, but their ranking this season differed from that of last season. This season Love and Kazungula Setaria Grasses gave the greatest average yields and Foxtail and Bambatsi Grasses the smallest, while Star and Love Grasses were the most responsive to nitrogenous fertilizer, and Bambatsi and Kazungula Rhodes Grasses the least.

To provide a sound basis of grassland management, a series of experiments with the effect of management on the growth, yield and vigour of various grasses has been started. This year work was with Sabi Panicum.

As would be expected, the seasonal shoot growth curve was found to be sigmoid. The growth rate was increasingly rapid until about the time the flower-heads were fully exerted, and thereafter declined. Root and stembase weights increased during periods when shoot growth was slow at the start of the season and in the late-season, remaining constant at other times. The increase in weight in the late season was much greater with uncut grass than with grass cut in mid-season.

The content and total amount of available carbohydrate in the roots and stembases declined during the first half of the growing-season and increased subsequently. During the late-season the content of carbohydrate in the roots and stembases of grass cut in mid-season was higher than in grass left uncut, and thus, although the increase in root weight was less, the trends in the amount of carbohydrate were very similar with both cut and uncut grass.

In a complementary experiment the effect of cutting at various times and heights during the growing-season on the vigour of Sabi Panicum is being studied. The general technique is to apply various cutting treatments in one season and to measure the effect of these on the recovery growth in the following season. Root weights and carbohydrate reserves are measured in the dry-season following the application of the differential cutting treatments. All measurements are made at two levels of nitrogen fertilizer, 400 and 800 lb. Nitrolime per acre per season. Samples taken in the mid-season show that there are marked differences in the root and stembase weights to six inches depth with the different cutting treatments, and equally large differences in recovery growth are expected when this is measured in the coming season.

Where a three-year-old stand of Katambora Rhodes Grass was ripped or disced early in the growing season to "improve vigour" it was found that herbage yields, but not seed yields, were greatly reduced by such treatment.

Where 2½-year-old Afrikander steers were used to assess the effects of nitrolime on the carrying capacity of a pasture of Kazungula Setaria grass (*Setaria sphacelata*), it was found that gains over the rainy season, from late December to early April, ranged from 216 lb./acre where 200 lb./acre of nitrolime was applied, to 368 lb. where 600 lb. was applied. Differences were due entirely to the greater carrying capacity of the more heavily fertilized pasture, as gains per animal were the same with all quantities of nitrolime.

WORK WITH LEGUMES

The dearth of nitrogen in sandveld soils, the great cost of nitrogenous fertilizers, the need for richer pastures than can be secured from grass alone, and the need for more pulses in African diets, have all turned attention towards the legumes.

In a comparison of twenty-five varieties of lucerne, yields for the first harvest year ranged from 1,230 lb. of fodder dry matter per acre with Tagiura to 2,870 lb. with Chilean 21-5.

In an observation of sixty varieties of groundnuts, it was found, with the short season already mentioned, that early maturing varieties out-yielded late-maturing varieties.

In an observation of ninety varieties of soya beans, some twenty gave yields of more than seven bags of threshed beans per acre, the greatest yield, with Potchefstroom 53/S/16 and Natal N/52/S/10, being 9½ bags per acre.

Earlier attempts, on topland, to assess the frost-tolerance of Dahl (Cajanus cajan) having failed through lack or uneven incidence of frost, a further attempt was made by planting 182 varieties along the margin of a vlei, where frost was almost certain to occur. All were severely frosted.

Where lime, borax, and superphosphate were applied at different depths in the soil for lucerne, it was found that response to all three fertilizers was greater where they were applied in the zone 9 inches to 15 inches beneath the soil surface than where they were applied less deeply (in the surface six inches) or more deeply (in the zone from 18 inches to 24 inches beneath the surface).

In a fertilizer trial with groundnuts there was some indication that lime at planting and gypsum at flowering must *both* be applied for either to be effective in increasing yield. In the same trial dressings of ammonium sulphate and triple superphosphate had no apparent effect on yield.

A laboratory for study of Rhizobium was opened on August 4th, and is getting into its stride. Nearly five hundred isolations were made.

Thirteen species of the genera *Trifolium, Lotus, Medicago, Dolichos* and *Desmodium* were sent to the Department of Entomology for search for eelworm. Moderate to severe infestation with *Meloidogne* spp. was found with six of the species, the remainder being free. Among those infested, unfortunately, was Kenya White Clover *(Trifolium cemipilosum),* otherwise one of the most promising of recent introductions.

WORK WITH OTHER CROPS

Work with other crops was continued and expanded. Most attention was given to maize, the only crop other than tobacco at all widely grown on sandveld soils, but work with groundnuts and potatoes was increased.

In the first year of a long-term experiment to compare nitrolime, ammonium sulphate and urea as nitrogenous fertilizers for maize, the responses were similar with all three forms.

In co-operation with Messrs. African Explosives and Chemical Industries Ltd., and Messrs. Pest Control, Ltd., tests of various herbicides for controlling weeds in maize were continued. It is clear that adequate control is feasible with pre-emergence sprays; post-emergence sprays appear to be less effective. A new herbicide, Simazin, was particularly useful against our worst weed—Rapoko Grass (*Eleusine indica*).

Where maize was cultivated for various lengths of time after planting to control weeds, it was found that yield was as great with two timely cultivations as with more.

In co-operation with the Department of Botany and Plant Pathology, potatoes of the Up-to-date variety were planted at fortnightly intervals from September 16th to October 28th to see if, by early planting, the ravages of Late Blight could be escaped. With supplementary irrigation as necessary, yields of over 150 bags per acre were obtained, but severe eelworm attack rendered half the crop unmarketable, and obscured any effects that date-of-planting on Blight attacks might have had on yield.

With potatoes for the summer crop, six varieties were compared for their resistance to Late Blight; Dutch Robyn and Gineke appeared to be the least susceptible of those tested. In a fertilizer trial, increases of nearly 20 bags/acre followed the use of nitrolime, but superphosphates and potassium chloride had little effect on yield.

In a comparison of three varieties of summer wheat, a variety from Angola gave up to five bags/acre, while the others gave but little more than one bag/acre. Where winter wheat was grown on a vlei margin, a yield of four bags/acre was obtained where moisture conditions were most favourable.

Giant Japanese Radish and Linseed, amongst various new crops being studied for use on saldveld, grew encouragingly well.

WORK WITH LIVESTOCK

Much of the work with livestock lies in measuring pasture production, and is mentioned or implied in other parts of the report.

Where groups of Afrikander, Mashona, Hereford and Sussex steers on natural grazing were given common salt from weaning to slaughter, their slaughter-weights and grading differed little from that of corresponding groups that had received no salt.

In their second mating season, Afrikander heifers running on natural grazing without supplement have had a much higher proportion of conceptions than similar heifers on the same grazing receiving, in winter, six gms. of sodium mono-phosphate daily and/or a maintenance ration of groundnut cake. The conception rate in the former group was 92 per cent. and in the latter groups 58 to 66 per cent. This was unexpected, as all four groups had had much the same proportion of conceptions (84-92 per cent.) in their first mating season. (This experiment, and that following, are being done in co-operation with the Federal Department of Veterinary Services.)

In a study of infertility in Mashona cattle, using heifers running on natural grazing, no seasonal variations of oestrus and conception were found, fruitful conceptions occuring with equal facility at all times of the year. The heifers were fed for maintenance of weight in winter.

WORK WITH SOIL PRODUCTIVITY

Underlying the work with pastures, crops and stock already mentioned, is the basic need to find farming systems that will maintain and raise the fertility of sandveld soils. As specific problems are analysed, so an assured basis is being provided from which broader and broader experiments are being synthesized to study effects of various practices on soil fertility. In general, the method is to gauge the residual effects of various practices by growing a test-crop of maize afterwards.

In the oldest of the Station's long-term experiments with grass leys, various combinations of ammonium sulphate, phosphate, potash and lime were applied to Star Grass each season for five years running. The ley was then ploughed and

test-cropped with maize for two seasons, with no application of fertilizer to the maize.

Phosphate and potash had no apparent residual effect on maize yield in either of the testing seasons, but lime and ammonium sulphate had powerful residual effects.

Where lime (but not ammonium sulphate) had been applied to the Star Grass, the yield of the first test-crop of maize was eight bags/acre greater than where none had been applied, but with the second test-crop yields were much the same whether lime had been applied to the grass or not.

Where large amounts of ammonium sulphate (but not lime) had been applied to the grass, the yield of both test-crops of maize was very much smaller than where none had been applied, the reduction with the first crop being eight bags/acre and with the second four bags/acre.

Where lime had been applied to the ley, the yield of the first test-crop was two bags/acre less where ammonium sulphate had been applied than where it had not. With the second test-crop, however, the yield was four bags/acre greater where ammonium sulphate had been applied than where it had not.

From chemical analyses of the soil it seems that repeated additions of ammonium sulphate had, by acidifying the soil, brought aluminium into solution in quantities toxic to maize. Lime countered this.

Where a well-fertilized Star Grass ley was ploughed at the end of its fifth season and test-cropped with maize, the yield of the first test-crop, *without fertilizers*, was 26 bags/acre, and that of the second 17 bags/acre. This season, a poor season for maize, the yield of the third test-crop was 11 bags/acre.

WORK WITH VELD

Neither crushing with a Holt Weedbreaker, nor burning has been found to be very effective in controlling *Lopholaena coriifolia*

The other long-term experiments on veld are being continued according to plan.

A study of ring-barking as a method of killing trees has been started.

WORK WITH IRRIGATED PASTURES

Preliminary trials have indicated that, of the perennial temperate-region grasses, Cocksfoot, Alta Fescue, and Meadow Fescue are the most promising for our conditions.

These three grasses are being grown alone, and in various proportions in mixtures, with and without red and white clover, and at two levels of nitrogen fertilizing.

A comparison of the yields of three grasses suitable for short-term irrigated winter pasture, *Bromus unioloides*, S.15 Oats, and H.1 Ryegrass is being made. The grasses are being grown with and without legumes, and at three levels of nitrogen fertilizing. During the period 23rd April to 10th September, 1958, the yields of all three grasses were similar. At the levels of nitrogen used, 0, 300 and 600 lb. nitrolime/acre, yields increased in direct proportion to the amount of nitrogen applied, being of the order of 6,000 lb. dry matter/acre at the highest level of fertilizing.

The dairy cows in milk strip-grazed the irrigated pasture for all but three weeks of the year. The quality of the pasture was adequate for maintenance and the production of four gallons throughout the year. It is now clear that slow growth may be expected during the cold months of the dry-season with pastures of Alta Fescue and Cocksfoot mixed with clover. Oats and Ryegrass, on the other hand, make satisfactory growth during the cold months.

Maize meal, groundnut meal, and a mixture of one part groundnut to two parts maize meal, are being compared as concentrates for milk production after the first four gallons produced. In the first part of the trial, during October, November and December, maize meal was as satisfactory as the other two concentrates for cows giving up to six and a half gallons daily.

CHEMISTRY LABORATORY

A chemistry laboratory was started in November, 1957. With limited facilities, some 822 analyses (excluding duplicates) have been made during the year.

MISCELLANEOUS

In an attempt to secure speedy establishment of Tanner Grass in subsoil (such as is exposed in making spillways) it was found that nitrolime and superphosphate were effective but that compost was not, the failure of compost being perhaps related to the water-logging of the site.

At the gauging weir installed by the Southern Rhodesia Division of Irrigation, run-off for the year October, 1957, to September, 1958, amounted to 1,260 cusec-hours from a catchment of about two square miles.

In routine measurements of percolation in lysimeters 75 in. deep it was found that, of the 40.38 inches of rain that fell during the season, 33.70 inches percolated below 75 inches on plots kept bare, while on plots bearing maize or Star Grass, only 24.47 inches was lost.

On the run-off plots both run-off and erosion were negligible.

GENERAL STATION MATTERS

A building to house a digestibility unit has been built, and a number of alterations to farm buildings have been made.

The Friesland herd was maintained at 35 cows in milk. The herd-average for all completed lactations during the year, including those of first calf heifers was 9,545 lb. milk at 3.84 per cent. butterfat per 300-day lactation.

All sheep affected by "Phalaris Staggers" as a result of grazing Ronpha Grass two years ago have now been culled from the Station flock, leaving a flock of 54 ewes from which to start again.

Thirty-six acres of maize, 130 acres of grass and munga silage, 21 acres of velvet beans, 90 acres of planted pastures for summer grazing, and 160 acres for winter grazing were grown.

It is estimated that about a thousand visitors came to the Station during the year.

About eighty sample-packets of grass and legume seed, and about the same number of bags of grass roots were issued. In addition large quantities of grass roots were taken by farmers themselves.

Seventy pupils were attending the Station's African school at the end of the year.

ACKNOWLEDGEMENTS

Very generous gifts of fertilizers were received from Messrs. Fisons (Rhodesia) Ltd., Messrs. Windmill Fertilizers (Rhodesia) Ltd., and Messrs. African Explosives and Chemical Industries (Rhodesia) Ltd.

HENDERSON RESEARCH STATION

DR. J. W. ROWLAND
OFFICER-IN-CHARGE

The Henderson Research Station lies in the centre of the maize growing area of Mashonaland, and serves some 10,000,000 acres of land, on which three-quarters of the maize, more than half the tobacco, and roughly two-thirds of the miscellaneous crops of Southern Rhodesia are grown. It supports one-quarter of the dairy cows and one-fifth of the European-owned cattle also.

With an annual rainfall average of 35 inches and extensive areas of rich loam soils, the region is suitable for intensive systems of mixed farming. The research which is in progress in crops, pastures and livestock, on both dry and irrigated land, is bearing out this view.

Fisheries research is in full swing.

STAFF

Throughout the year the European Staff has been up to strength, save for the short periods when replacements were effected. All residential accommodation was occupied. The post of operator was converted to European Works Supervisor and filled. One additional Field Husbandry Professional Officer was transferred in to the Crop and Irrigation Section. All vacancies in the African fixed establishment were filled.

DEVELOPMENT

Buildings and Construction. The new laboratory and office block was completed and is now in use. A telephone exchange has been installed and although the power, light and water installation has yet to be completed, working conditions have been immensely improved. A house was built for the Chief Fisheries Officer near the Savory Dam.

On the Fisheries Section, new ponds, sluice gates and rice paddy fields have been constructed and many improvements have been made.

Stock handling facilities have been installed in the north western and north eastern sections of the Station, including spray races, weigh bridges, sorting pens, feeding yards and crushes.

A stone entrance gate to the Station was completed and two miles of roads were gravelled.

An experimental dairy was set up in the Pasture Section and some five miles of fencing were erected.

On the Irrigation Section, a series of "measured water" plots were constructed with waterproof partitions for studies of the influence of time and intensity of winter flood irrigation on various crops.

CLIMATIC CONDITIONS

The year 1957-58 has been a difficult one. Very little rain fell until December 26th, and thereafter it fell copiously for ten weeks until early March, when rain ceased completely. Maize was in cob at the time and pulled through yielding a satisfactory crop on lands where adequate fertilizer and organic matter was present. In the lands where no fertilizer was used, the crop was poor. Nitrogen applications went far to counteract the evil effects of excessive moisture both on pastures and crops. Pasture conditions were poor also. The absence of spring rains and the great heat resulted in the virtual absence of pasture growth except in moist vleis until after midsummer, and the heavy midsummer rains made control of pasture growth difficult. The newly established Rhodes grass pastures were of great value to the 450 head of cattle on the station.

RESEARCH OBJECTIVES

The work on the station is directed towards increasing the efficiency of farming and reducing costs of production. Greater yields per acre, per unit of capital, labour and fertilizer are sought, by way of improved crop and irrigation techniques, improved pasture use associated with appropriate livestock management techniques and improved nutrition. The costs in terms of water and soil loss of different systems are being studied also.

The work is opening up prospects of great improvements in Agricultural methods with greater economic stability for farmers, higher soil fertility and improved African nutrition and welfare generally.

The detailed studies in the pasture, crop and irrigation, animal and erosion sections are providing information which is being incorporated into the 300 acre intensive farm unit, which showed a small profit in the year ending September, 1957. In this year the excess revenue over expenses, excluding the manager's salary and bonus is in the region of £1,000. Soils are improving under the system and the possibilities of great improvements in method and profits in the future are becoming clear.

This pilot farm unit now comprises 42 acres of crops, 120 acres of Rhodes and Napier Grass, ten acres of irrigated pastures and 100 acres of veld. Some 110 head of dairy stock of all ages produced 25,000 gallons of milk for sale and the value of natural increase of the cattle was in the region of £1,000. Five hundred and ninety bags of maize were sold, making a round total of sales of £7,000 worth.

Attention is being concentrated on improving the quality of home grown forages with a view to reducing the feed bill, which was some £1,600. The dairy herd is now established and in a position to sell surplus stock for the first time.

PASTURE RESEARCH SECTION

Investigations have been conducted to establish productive forage sequences for specific classes of stock, such as breeding cows, weaners, heifers, tollies and dairy cows, with particular emphasis on the characteristic nutritional needs of each.

Vlei Grazing. This provided beef breeding cows with satisfactory grazing for 63 days in spring and enabled a 100 per cent. calving rate during November.

Due to the lateness of the rains, veld grazing was extremely slow in growth and a stocking rate of one cow per four acres was sufficient for the animals' needs during the early part of summer. This position was further aggravated through cessation of the rains in March, and despite the use of reserves, all camps were grazed down before the end of the season. The animals' liveweight performance was, in consequence, below standard and the year's work showed that revised plans for the provision of summer grazing are required.

Pastures which were receiving small dressings of 20 lb. to 40 lb. nitrogen in November, and allowed to grow without grazing or cutting during the season, produced four tons of air dried herbage per acre. When this material was grazed "in situ" by beef cows some 60 grazing days per acre was obtained. Late cutting and stacking of the grass in May increased the number of feeding days per acre to 210. In both cases there is a need to supplement the animals with protein rich feed for satisfactory liveweight gain. Where this rate of gain is a little over maintenance, urea has been successfully employed for this purpose.

A mid-growing season cut taken from this type of pasture reduced the yield but did not affect the quality of herbage available for late cut hay. To overcome this reduction it was necessary to apply an additional dressing of nitrogenous fertilizer after the midsummer cut.

Pastures fertilized with 80 lb. nitrogen and 200 lb. superphosphate per acre provided eight tons of silage per acre taken in a single cut in mid-growing season. In addition to this, the aftermath growth provided productive autumn grazing through April and May which was employed to extend the grazing season obtainable from veld. Use of the grass silage, together with maize stover and Jack Bean meal, enabled 800 lb. beef steers to gain ¾ lb. per head per day throughout the winter.

A forage sequence of summer grazing on veld, autumn grazing of pasture aftermath growth and winter feeding with grass silage, maize stover and Jack Bean meal has produced 30-month-old beef steers with liveweights in excess of 1,000 lb.

The use of improved pastures for summer grazing has shown that when these are fertilized with 80 lb. nitrogen and 200 lb. superphosphate and stocked at the rate of one dairy cow per acre, 26 weeks of grazing are obtainable. A dairy herd of 24 cows and 12 followers together with the requisite pastures and facilities have been established to investigate a system of seasonal milk production. The system relies largely on the 26 week summer grazing period to supply feed for the greater part of the lactation. Initial investigations using the recently developed tracer techniques to study herbage consumption were conducted, and the method has proved satisfactory.

A field scale investigation in the use of Jack Beans has indicated that large quantities of good quality hay are obtainable from this legume. The hay can be conveniently made after the rains in May and is readily eaten by all classes of stock, including dairy animals. For convenience of feeding it is preferable that the hay be coarse milled in the hammermill.

The establishment of pastures by seeding under maize and legume crops has proved most satisfactory and greatly reduces establishment costs.

ANIMAL HUSBANDRY SECTION

The European staff position on the Section proved rather difficult this year. Mr. W. Winkfield, who was acting Stockman, resigned in October and was replaced by Mr. C. H. French. Shortly after this appointment, the Senior Animal Husbandry Officer undertook a study tour in the United States of America and the United Kingdom. He was away for four months and during this period only the long-term research projects were continued. All short-term studies such as digestion trials and herbage consumption studies, which are the normal summer working programme for this Section, were temporarily suspended.

The summer rainfall conditions were difficult. While the growth and production of the beef stock were quite satisfactory, the carrying capacity of many of the newly established pastures was very poor. Silage yields were also low but in all the experimental work the confidence placed in the possibilities of using low quality roughages for wintering beef stock has been amply justified.

A certain amount of development work was carried out during the year. The feeding and dipping facilities on the Northern section were completed but the watering points in this area are not yet completed. Due to lack of funds it was only possible to instal temporary handpumping equipment.

Approximately 90 head of cattle were sold during the year. These were mainly Aberdeen Angus which have been used in breed comparison studies during the past five years. A few young females have been retained as a nucleus for further more detailed digestion and nitrogen balance studies.

Review of Experimental Work. The long-term study of the influence of nutrition on fertility in beef cattle has continued quite satisfactorily throughout the year. The animals were bred for the second time during the February, March and April breeding season.

The results to date indicate the following:—

(a) In this particular trial and on this particular veld type, the supplementary addition of both minerals and protein rich feeds to the winter veld grazing has a beneficial effect on either preventing excessive weight losses or in promoting positive weight gains. Control animals grazing on winter veld alone sustain losses of from 100 to 150 lb. in body weight during the six months from May to October.

(b) These weight losses or winter weight changes in pregnant cattle are not reflected in the birth weights of their calves but are directly correlated with the weaning weight of these animals.

(c) The level of winter nutrition or the capacity to maintain weight is very closely related to the fertility during the subsequent breeding season.

The study is to be continued throughout the productive life of the animals and the long-term effects can only be accurately assessed at the completion of the trial.

Investigations into the utilization of low quality roughages has continued. The accent this winter has been the more detailed investigation of the effects of protein on appetite and consumption as well as the breakdown and isolation of the observed responses to mineral supplementation.

These results can be briefly summarised as follows:—

(a) A marked response to protein supplementation has been consistently observed. This response to successive protein additions is not linear but tends to diminish and the increments are insignificant at about 1 lb. supplementary digestible protein and above. It is assumed that this level indicated the upper limit of energy availability of the roughage—both veld grazing and low quality maize crop residues.

(b) The response in body weight to protein supplementation can occur in one or more of several ways:

(i) More efficient metabolic utilization due to a more favourable "balance" of nutrients.

(ii) The raising of energy availability of the basal roughage through—

(i) increased consumption or the stimulatory affect on appetite—

(ii) increased digestibility of the roughage fraction.

Undoubtedly (i) above is an important factor. The effect of protein supplementation on appetite has been studied this winter and it has been noted that the raising of the total protein in the ration from three or four per cent. to seven or nine per cent. causes a marked stimulation of appetite—of the order of 60 to 80 per cent. increased roughage consumption. Apparently under the conditions of this trial successive additions of supplementary N from three to seven per cent. total protein equivalent causes corresponding increases in consumption. Above this level, however, additional protein had no effect on appetite.

Whether or not supplementary protein causes a change in the digestibility of the basal roughage is still under investigation.

Regarding the effects of mineral supplementation, the results to date are by no means conclusive. The following facts appear to be reasonably valid.

(a) There is a consistent response in body weight growth to the addition of minerals to low quality roughage rations. This response, except in the case of fertility, appears to be relatively small—10-20 per cent.

(b) The evidence indicates that the main stimulatory effect comes from phosphate additions. Copper, Cobalt and Sulphur additions produce variable and inconclusive results.

CROPS AND IRRIGATION SECTION

Due to the change in staff and lack of funds no large scale development took place and the research programme had to be curtailed to a certain extent. However, the laying out and construction of plots for water duty work, laying of pipelines, construction of culverts, planting of grass in waterways and maintenance of existing services was done.

Some of the Research projects had to be omitted but all permanent trials continued. A long-term Dairy Rotation Experiment was initiated on 1/6 acre plots, the aim of this experiment being to investigate means of producing a steady flow of green fodder as well as cash crops under irrigation on an integrated farm.

The results obtained during the past season worthy of mention are:—

Despite late rains and a short rainfall season, the trashed, high nitrogen, high population maize, after five years "continuous maize", produced 26.3 bags as compared with the "legume for silage/maize plus five tons manure/maize" rotation at 31.1 bags average for the two maize crops, and the "maize/green manure" rotation at 28.1 bags per acre. In the Maize Population/Fertilizer Trial good responses were obtained from the use of nitrogen, although the high population/high nitrogen combination was not superior to all other treatments as in previous seasons. For example, the effects of nitrogen and population in 1957-58 (1956-57 in bracket) were:—

YIELDS IN BAGS PER ACRE

Plants per acre	Nitrogen Treatment			
	NO	N.250	N.500	Mean
12,600	9·0 (13·1)	19·1 (22·0)	20·5 (23·3)	16·2 (19·5)
14,520	13·9 (11·6)	14·1 (16·3)	24·6 (25·6)	17·5 (17·8)
16,940	7·8 (8·6)	16·6 (15·7)	23·2 (28·0)	15·9 (17·4)
Mean	10·2 (11·1)	16·6 (18·0)	22·8 (25·6)	16·5 (18·2)

N. O — No sulphate of ammonia.

N.250 — 250 lb. sulpahte of ammonia per acre.

N.500 — 500 lb. sulphate of ammonia per acre.

Supplementary irrigated maize planted a month before the first rains with one irrigation only at planting, 80 lb. N at 5-6 weeks and 30 lb. N at tasseling yielded 31.5 bags while maize irrigated at planting and every ten days thereafter until the first rains, giving a total of four irrigations (also 80 + 30 lb. N.) yielded 31.0 bags per acre. Similarly maize planted two months before the first rains and

irrigated once only yielded 17.7 bags as compared with 29.0 bags per acre for maize with supplementary irrigation (seven irrigations).

Chemical weed-killers brought about good weed control in maize with the use of 1 lb. acid equivalent per acre of M.C.P.A., or 2, 4-D Ester or 2, 4-D Amine each with two cultivations. The mean yields in bags per acre from three replicates were:—

1 lb. M.C.P.A. + two cultivations = 20.3.

1 lb. 2, 4-D Ester + two cultivations = 22.8.

1 lb. 2, 4-D Amine + two cultivations = 21.5.

Two cultviations only = 13.0.

Clean cultivated throughout the season = 19.6.

Wheat. Punjab was found to be the most successful (8.8 bags per acre) of eight varieties of winter wheat tested in 1957. This variety, however, has the disadvantage of being susceptible to lodging. Poor yields were obtained from all varieties and weedkiller treatments of summer wheat, 2.6 bags per acre being the highest yield obtained. Weed control and varietal suitability remain the most important problems in summer wheat production.

Legumes. Lucerne was not very successful but a collection of varieties as well as fertilizer observations and pest control trials were undertaken. Soyabeans still showed promise with grain yields of 6.6 bags per acre, and 5.4 tons of hay per acre, obtained from field scale plantings. Groundnuts were rather disappointing, the highest yield obtained being 788 lb. shelled nuts per acre. The addition of kraal manure and superphosphate did not increase yields appreciably.

Other crops. The highest castor bean yield obtained was 350 lb. unshelled beans per acre. This low yield was largely due to *Botrytis* disease and the pest *Eurystylis Capensis*. The cotton crop was not very successful due to late planting. However, due to good insect control by means of Endrin insecticide an estimated yield of 700 lb. of clean seed cotton was obtained.

In the March, 1958 crop, potatoes grown under a nine-ton per acre straw mulch, produced 111.4 bags, as compared with 92.3 bags per acre for the unmulched plots. From the results of a Potato Seed Rate/Seed Size Trial it appears that, within reason, planting distance can be adjusted according to seed size to achieve an optimum seed rate, and that small seed is not superior to large seed.

Some trials have been and are being carried out on vegetables with particular reference to seed production. However, at this stage it is too early to be able to report on this work.

In order to ensure the continuity of work in irrigation on this Station it is essential that a regular supply of water be available throughout the year. This is not the case at present, and until a large storage dam is built in the catchment area of the Dassura or the Mgutu River, there is a danger of research projects suffering from a lack of regular water supply.

FISHERIES

Work is proceeding along the lines of consolidation of existing undertakings, primarily, and the extension of new projects suggested by previous work and the present circumstances of fisheries in the country. Of necessity new projects have had to be severely curtailed since the existing programme occupies much time, energy and facilities. Basic and applied research is carried out at the Fisheries Research Centre while extension of experiments observatories, surveys, advisory work and organizational activities form a network throughout the Colony.

The potential of fisheries in the country in fields as apparently diverse as "sporting-tourist" attractions and good farming practice is becoming increasingly obvious to all sections of the community. This of course results in a snowballing of problems to be investigated and work to be done.

Organization. Contact is being maintained and extended in respect of all Government and other bodies connected with the water resources of the country and the possible utilization of them for fish production. The Chief Fisheries Officer has served on various committees in an advisory capacity on matters such as trout fishing, conservation of natural resources and others directly concerned with fisheries. Contact and liaison are also maintained with angling organizations, farmers' associations, I.C.A. Committees and educational bodies.

Staff. The staff position remains unchanged. However, with the existing establishment it is impossible fully to develop the available resources of fish as food production, to take only one aspect of a fisheries organization.

Fisheries Research Centre. The Fisheries Research Centre is the focus of research and investigational work concerned with fisheries exploitation and development.

Whilst no large scale building or development is now taking place, constant additions and improvements to the already existing framework are being made. Outlet sluices have been installed in a number of ponds, sorting basins have been built and ponds for bass rearing brought fully into operation. Roads are still being extended to allow full access to all pond areas. Some form of motor lorry transport is highly desirable. Fencing of the pond area is still of vital necessity but it has not yet been financially possible to do this. However, the quarantine pond area has now been enclosed. New rice paddies embodying improvements suggested by previous experience have been constructed.

In addition to experimental work with various species of *Tilapia* a number of other kinds of fish are being established. Rearing of large-mouth black bass has begun and spawning started in mid-September. Carp from existing strains in the country are being established and stocks should soon be sufficient to put these on production trials. Arrangements have been concluded to obtain pedigree mirror carp from Israel and these should arrive shortly. Tench from South Africa have been obtained and are being reared for spawning. These fish are considered to be of importance, as, being snail eaters, they could prove of extreme value in the control of bilharzia. *Tilapia macrochir sensu strictu* have been acquired from the Belgian Congo. These are under preliminary observation pending comparative trials. They differ in several respects from our Tilapia *"Macrochir-Andersoni"*.

Current culture experiments are concerned with the elucidation of management methods which will achieve maximum production and yields of over and above carrying capacity in a year. The majority of the experimental series terminate in October-November. All production ponds are under high stocking rates and intense artificial feeding. Basic stocking problems with regard to some species of *Tilapia* in monospecies culture and mixed culture are being investigated in research ponds. Experiments with intermediate fishing are proceeding. The role of artificial feeding has been investigated and interesting and encouraging results have been obtained. Intensive feeding of *Tilapia melanopleura* is being carried out and results indicating maximum population under this and different stocking levels are expected to provide further pointers to management techniques.

Experiments utilizing pig manure and using ducks on ponds are continuing. Higher stocking rates are being investigated in order to assess the ultimate level of nutrition afforded by these methods. Taxonomic work on various fish species has proceeded as the opportunity has presented itself.

Outside Work. During the course of the year three series of experimental fishing surveys were carried out on Lake McIlwaine. In addition limnological observations during the course of the year are helping to establish the seasonal cycle of changes in water character (e.g. stratification, etc.). Similar surveys are being conducted on Mazoe Dam while experimental fishing has been done in a variety of types and sizes of artificial dams and also in natural waters.

Stocking experiments in ponds and dams away from the centre are being followed. In this way practical difficulties faced by the would-be fish breeder with no experience are being brought to light.

In conjunction with the Department of Conservation and Extension, Mashonaland Region, a number of field trials similar to those mentioned immediately above are being carried out. This will have three main and important results—familiarizing Conservation Officers with fisheries matters, assisting farmers and giving us results of semi-intensive culture in dams.

General.

(1) A course of lectures was given by the Chief Fisheries Officer to Gwebi Agricultural College Students.

(2) Field Days and I.C.A. meetings in many areas were attended and discussions with local bodies were held to aid publicity and education in fisheries matters.

(3) Visitors during the year included people from many parts of the world, colleagues from neighbouring territories and abroad, from F.A.O. and the Colonial Office.

(4) The Chief Fisheries Officer was invited to present a paper at the Meeting of the International Union for the Conservation of Nature and National Resources held in Athens, Greece in Setpember, 1958. He attended the meeting and presented the paper "Dams and Drowned-out Stream Fisheries in Southern Rhodesia". While abroad he is making a brief study tour of fisheries organizations and installations in the Mediterranean.

MISCELLANEOUS

During the year, the Scientific Society held ten meetings at which an average of 90 people attended. The number of visitors to the Station increased considerably to over 2,500, and many groups of visitors from the farming community, from schools and from urban industrial interests were received.

The annual Young Farmers' Club Camp was held at Henderson in May when 100 young farmers attended.

MATOPOS RESEARCH STATION

J. M. RATTRAY
OFFICER-IN-CHARGE

INTRODUCTION

Staff. Except for two African Agricultural Assistant posts, all vacancies had been filled by the end of the year.

One Technical Assistant's post has been transferred to Henderson Research Station.

Through the courtesy of F.A.O. the Officer-in-Charge was able to complete the Grass Cover Map of Africa, commenced last year, while on long leave in Rome.

Housing. The Public Works Department have commenced painting and renovating the offices and houses on the Station.

Native School. This is functioning successfully with 91 children in attendance.

Beer Hall. The present system whereby the Africans do their own brewing continues to work satisfactorily under the supervision of the Farm Superintendent.

Building. The new Central Store has been completed.

Compound. Seven new single quarters have been completed to roof height.

Roads. Over one mile of road has been resurfaced.

Crops. The season's rainfall was about 21 inches fairly well distributed. Some 415 tons of silage and 327 bags of maize were harvested off 112 acres, and 134 tons of hay were reaped off 138 acres of velvet beans.

General. A large number of meetings, conferences and Farmers' Days were attended and numerous addresses given by various members of the staff.

The Station contributed material to the Departmental Exhibit on the Bulawayo Agricultural Society Show.

A large number of visitors were shown round the Station.

FIELD HUSBANDRY SECTION

The crop-growing season, of 74 days in which 15.4 inches of rain fell, was unusually short and included a period of eighteen days in which 9.4 inches of rain fell.

Soil Moisture Studies.—Preliminary investigations on the use of gypsum electrical resistance blocks for soil moisture studies proved satisfactory and is to be expanded. Work was also done on guard row effects, missing hill effects and minimum plot sizes.

Climate Studies. Since climatic factors are limiting to crop growth preliminary attempts were made to assess various climatic factors, particularly length of season and avialable moisture and to relate them to crop response.

Dryland Agronomy. Maize and Sorghums. Work continued on dryland agronomy problems such as optimum population, nitrogen and phosphorous requirements for maize, optimum spacings for sorghums and a three-year study of compost requirements for maize on granite sands was completed.

Silage. Silage investigations were continued by comparing yield of various crops at different spacings and populations. The plan to carry these studies through to digestion trials was unfortunately delayed but it is hoped a start can be made soon.

Hay. Hay crops were compared for yield at various spacings and further information was obtained on field losses. A few samples of hay are to be put through digestion trials by Henderson Research Station but it is hoped that digestion trials at Matopos will soon be possible.

Castor Beans. An extensive Castor Bean experimental programme was conducted all over Southern Rhodesia and in spite of an unfavourable season very useful indications were obtained on varieties and fertilization. Work on optimum spacings and time of planting were continued at Matopos.

Rotation. Rotation trials were continued on the heavy soil but it will be a few more years before they can be concluded. On the light granite sand the proposed rotation trial was postponed in order to move the site of the experiments to a more suitable and representative area; it is hoped to start a rotation/fertility trial on the granite sand next season.

Cultural Methods. The stubble Mulch trial was continued as was the Lister trial; neither have given any conclusive results so far but are to be continued.

Irrigation Agronomy. Under irrigation, potatoes again showed a marked response to early (September) planting and the variety trial provided useful data for the Potato Breeder in Salisbury.

The Lucerne variety trial with twenty varieties was concluded after two full seasons and will be replaced by a Federal Lucerne variety trial next year.

Plant Breeding. Maize. Plant Breeding work continued with variety trials being carried out at Gatooma, Gwelo and Nyamandhlovu in addition to Matopos and although the season was unusual it was found very advantageous to have trials conducted at these climatically different centres.

The emphasis in the maize improvement programme is more on the production of synthetic varieties than hybrids in the belief that they will be more suited to the conditions in the lower rainfall areas. Selections were made from the open-polinated varieties Teko Yellow, Kroonstad Robyn and American White Flint, inbreeding was continued and top-crossing for the testing of general combining ability was carried out on both white and yellow inbreds. Other work on maize included variety crosses and the conversion of the white Rhodesian Hybrids I, VI and VIII to yellows.

Sorghum. The programme of sorghum improvement was continued by carrying out large scale variety trials at Matopos and Nyamandhlovu in order to reduce the number of varieties, suitable to different climatic areas, to a few on which improvement work can be initiated. From the work done so far it appears that a variety's length of maturity may be a critical factor in defining its suitability to a particular area.

Millet. Work on Millet improvement has been started by collecting grain varieties from various parts of this country and overseas and by an investigation to determine the amount of improvement likely to result from recurrent selection. This work is being done co-operatively with the Native Agricultural Department's Station at Tjolotjo.

Crop Ecology. The great variation in climatic conditions from place to place in one season and also from season to season at the same place makes it essential to have trials conducted at a number of different centres if conclusions are to be reached on any problem in reasonable time. With this object, agronomy work is to be increased at the Nyamandhlovu Sub-station (where an additional technical Assistant is to be stationed during the growing season), the Native Agricultural staff at Tjolotjo have kindly agreed to carry out a bigger crop trial programme and Gatooma Research Station continues to conduct trials on behalf of Matopos. This coverage should improve assessment of crop response to different climatic conditions and it remains only to represent the various climatic parameters so that correlations can be established.

PASTURE RESEARCH SECTION

Development. Very little development work was carried out during the year. Works undertaken included:—

(1) The fencing of Experiments 67 and 68—stocking rate trials based on the four-paddock, three-herd system of veld management in which burning is incorporated. The former is on undisturbed thornveld and the latter on cleared thornveld.

(2) The ploughing and fencing of 10 acres of virgin sandveld.

(3) The planting of 20 acres to a Rhodes Grass/Lucerne mixture.

(4) The partial fencing of a new goat and cattle grazing trial.

Research.—Veld Management Experiments. The last of the original veld management trials on thornveld have been replaced with more critical experiments, Experiments 67 and 68 (see above) having commenced in January, 1958. In the sandveld, only Experiment 8 (three-paddock, one-herd, burning) remains of the original trials. This has been retained because spectacular results are being obtained in reducing bush density. *Terminalia sericea,* particularly, and *Burkea africana* are the tree species most affected by the fires.

The useful effect of fire in controlling bush is becoming more and more obvious as the veld management trials progress and it is apparent that the trees in the sandveld are very much less resistant to fire than those in the thornveld.

Although animals on continuous grazing treatments are still exhibiting slightly higher live weight gains than those running on systems of deferred rotational grazing the difference is far less than in previous years. Results indicate that the animals on continuous grazing will, in another year or two, weigh less than those on a deferred rotational system. It is apparent that the veld is deteriorating in the continuously grazed paddocks, an effect which is reflected not only in the animals but also in the veld itself. In these paddocks patch grazing is becoming a problem and bare areas are increasing in size owning to heavy grazing eliminating the more palatable perennial grasses. At the same time the more unpalatable species have become so rank that they are now dying out and are being replaced by annual grasses and weeds. There are also indications that there is very much more bush in paddocks continuously grazed than there is in those subjected to burning every fourth year and grazed according to a system of deferred rotational grazing.

Fixed Belt transects 1,000 feet long and 6 feet wide are being put through all the veld management experimental paddocks in order to facilitate a closer study of the bush/grass relationship.

In the stocking rate trials, although the lowest individual liveweights have been obtained from animals at the heavier stocking rates each year, these treatments have always given the highest production on a per acre basis. In Experiment 67 and 68 the heaviest stocking rate is 1:6 and in Experiment 37 a treatment at 1:5½ has now been included. These treatments should be sufficiently drastic to reduce the production per acre to less than that of more lenient treatments.

In Experiment 30 (stocking rate trial based on the four paddock, one herd with burning system) the heavier stocking rates are having an adverse effect on the veld. Paddocks grazed at 1:8, in particular, and 1:10⅔ are now producing visibly less grass than those more leniently stocked. As a result fires in these paddocks are now less intense than in the past and the bush will, therefore, be more difficult to control.

Veld Burning Experiments. For some years it has been apparent that *Autumn burning* is detrimental to the grass cover and has little effect on the bush. *Complete protection,* too, has caused grass to become moribund and die out and encourages the encroachment of tree species.

Lately, *Annual burning at the end of the dry season* on red soil has caused almost all grasses other than *Themeda triandra* to die out and has resulted in very poor grass growth and a severe decrease in basal cover. This effect is also becoming apparent, although less marked, where the treatment is applied every other year.

Burning *just before the rains set in* at intervals greater than those mentioned appears to control bush and to have no lasting deleterious effect on the bush.

In experiments designed to measure the amount of dead material (that would be available for burning) that accumulates with varying periods of rest results show that the bulk of material increases from year to year up to four years. It is not yet known how long this increase will continue.

Plant Succession Experiments. Continual heavy grazing has reduced the grass cover on red soil to one of annuals (chiefly *Chloris virgata* and *Eragrostis patentipilosa)* and has caused rapid encroachment of *Acacia spp.* Recovery under complete protection from such treatment takes anything up to five years. On *Sandveld* the effects are less severe and although many perennials have been suppressed *Digitaria pentzii* is still persisting as the dominant species, although lacking in vigour. Bush encroachment is not serious.

In seasonal grazing experiments *moderate continuous summer grazing* is damaging perennial grasses and encouraging annuals. *Complete protection* causes the perennials to become moribund and die out, and there are indications that grazing in the first half of the growing season is more damaging than in the second half. All treatments encourage bush encroachment on red soil but there are no indications of this happening on sand.

Veld Fertilizer Experiments. Very big responses in grass yields (up to a six fold increase) are obtained on *sandveld* from the application of 600 lb. or

more of sulphate of ammonia per acre. Only small increases are obtained on *black soil* from similar dressings whilst on *red soil* there is no response.

Chemical Bush Control. Preliminary observations indicate that very good results have been obtained in killing *Acacia spp.* with the *butyl ester 245T in dieseline* and with *Shell Diesel Fuel* applied to slashes in the bark of the stem. *245T in water* and *Ammate* have proved ineffective whilst the results from *ring barking* have been disappointing although the figures may well be improved when the final assessment is made during the coming season. *Acacia rehmanniana* was more resistant to all treatments than *A. karroo, A. nicolata, A. gerrardii* or *A. nigrescens.*

Feeding Trials. Yearling steers fed a basic ration of 2½ lb. maize meal per head per day lost 3 lb. per head between 16-6-58 and 30-8-58. Where this ration was supplemented with the same amount of pod meal weight increases per head of 24 lb. were obtained from *Acacia giraffae,* and 14 lb. from *Acacia nilotica. Pilostigma thonningii* gave no increase over the basic maize ration whilst *urea and molasses* gave an increase of 31 lb. Bean hay alone (3 lb. per head daily) gave a weight increase of 18 lb.

During the period, 5/7/58 to 9/10/58 cattle lost 34 lbs. per head on standing Rhodes Grass sprayed with *urea and molasses* and from 6/8/58 a similar group lost 18 lb. on Rhodes Grass mown and then sprayed with urea and molasses. Most of the loss followed a fall of about one inch of rain in September which caused a certain amount of grass growth and which put the animals off the dry grass. It would seem that two beasts can be carried per acre on Rhodes Grass treated with urea and molasses for a period of three months during the dry season.

Dryland Pastures. Of the pastures established during the year only fair results were obtained in the ten acres of Bambatsi Panicum and Lucerne established on red soil. The lucerne established well but the Bambatsi had to be replanted owing to poor germination and the stand is still not good.

A similar planting on sandveld germinated well but the Lucerne died out owing, presumably, to faulty innoculant.

Little success can be reported from the 17 legumes being tried out for frost tenderness, leaf retention and adaptability. All were frosted severely and none would appear to be useful as foggage crops.

A variety trial and a phosphate/boron trial with dryland Lucerne were established during the year but no yields have been taken to date.

The fertilizer trial on Gold Coast Napier Fodder will be concluded during the coming season. Nitrogen is the element giving greatest response.

Irrigated Pastures. Of the perennial pastures tried Ronpha appears to be the most persistant and productive next to Lucerne. It is, however, disliked by cattle but sheep graze it readily. No cases of Phalaris staggers have occurred.

Alta Fescue does not persist well after the first season, and Cocksfoot is very slow in establishing and does not look very promising at present. Chilean Red Clover and New Zealand Wild White Clover do well with the above grasses. Kikuyu does well but does not warrant irrigation as it is completely unproductive in winter.

Water Relations—Run-off Plots. The completely bare plots have a significantly greater loss of water and soil than any other treatment. No other treatments show significance.

The percolation of rainwater to four feet is greatest under fertilized Maize and least under fertilized Bambatsi. Unfertilized Bambatsi allows more percolation than fertilized Bambatsi but less than fertilized Maize.

General. No unscheduled fires entered the experimental areas during the year although several were stopped on the boundaries.

The grazing trial (in corporation with the Department of Conservation and Extension) at Devuli continues according to plan, and another such trial is to be laid out near Shabani.

Experiments are to be conducted on the Falls road to find the best grasses for vegetating road verges in Kalahari sand.

ANIMAL HUSBANDRY SECTION

Development. During the period under review 3,815 yards of new fencing was erected at Lonsdale farm and at Lucydale 60,000 bricks were made to build additional tower silos.

On Westacre Creek a sprayrace was installed and an engine was erected on an old well to supply water to the cattle in the adaptability trials.

Research—Beef Production. The nutritional factors limiting beef production on free range in Matabeleland have already been subject to numerous investigations, but as yet no experiments have been conducted to determine whether the plane of winter nutrition can be raised economically by producing high quality fodder crops.

Experiments are, therefore, in progress on Lucydale farm to determine the costs of beef production between cattle reared on free range as compared with the wintering of cattle on high quality home grown feeds.

The animals in these studies consist of Africander cattle which are being subjected to different systems of selection to determine whether genotype environment interactions within breeds may be influenced by the system of selection employed.

These studies have now been in progress since 1957 and the first crop of calves from these mating systems have been weaned. As may be expected the animals which were fed in winter are far superior to those reared on free range; at this stage, however, the data are too limited to draw any conclusions on the cost of production between the two systems of management.

Adaptability Trials. From the results of previous experiments it has been proved conclusively that the indigenous cattle are better adapted to local conditions of free range than the British beef breeds.

There is ample evidence available to show that malnutrition in winter is mainly responsible for the poor performance of the imported cattle, but apart from this no information is available to indicate in what respects these breeds differ physiologically. As a knowledge of these factors will assist greatly in developing systems of management for the various breeds the reactions of two groups of Native and Hereford cattle are being studied very carefully under different treatments.

Dairying. The main problem confronting dairy farmers in Matabeleland is essentially one of cost of production and experiments will be started shortly to determine to what extent production costs can be decreased by obtaining a better balance between home grown feeds and purchased concentrates.

Mutton Production. The selection of smooth coated sheep from Dorset Horn x Blackhead Persian crosses is being continued and different systems of management are being devised to keep sheep more profitably under conditions as prevail on the average cattle ranch in this part of the country.

NYAMANDHLOVU PASTURE SUB-STATION

Staff. There was one Pasture Research Officer, one Technical Assistant, one part-time typist and one African Assistant on the station staff.

An average of 23 male Africans were employed during the year, ten females were employed during the growing and reaping seasons.

Climate. The rainy season was excellent, 26.46 inches were recorded at the office and the distribution was good. Although the winter was mild, steers began losing weight in early June and the young stock were in poor condition by the end of September.

Development. An african cottage for two families was completed, two pump-houses were rebuilt and plastered, the construction of bachelor quarters for a Technical Assistant (crops) was well under way. A 220v, A.C.3 Kilowatt lighting plant was installed and connected to the two houses. The plant gave excellent service and has sufficient capacity to supply the new bachelor quarters.

In the black Basaltic clay area 216 acres were stumped and cleared leaving shade trees only and the area was fenced into 16 paddocks. In June 1958 a replicated stocking rate trial was started on this area, the rates being 1:3, 1:5, 1:7 and 1:9 for winter grazing only.

The first block of a replicated stocking rate trial on red sandveld was fenced by the end of September and grazing will commence at the end of January 1959.

No new work was done in the Kalahari sandveld because of lack of funds and fencing materials.

Research—Kalahari Sand. (Summer grazing only). Fencing and layout has been inadequate for the starting of any new experiments in this veld type but two of the original experiments were continued. Steer weight gains were higher where burning was included in the manegement than in the experiment with no burning. The necessity for using fire in the management continues to be confirmed.

Basaltic Clay. (Dry season grazing only). The hay yield on this veld type was 0.75 tons per acre.

In the cleared versus uncleared bush experiment, the cleared veld carried 66% more cattle through the dry season and the cattle weighed an average of 25.5 lb./head more than those in the uncleared paddocks.

In the new stocking rate experiment the steers in the one beast to three acres treatment were not losing weight any faster than in the lighter rates at the end of September.

Where three beasts were allowed access to a good stand of one acre of Senegal dolichos foggage for three hours on two days each week it was found that there was no significant difference in weight loss by the end of September as compared with the veld grazing groups.

Red Sandy Loam. (Year round grazing). In the stocking rate trial the 1:8 treatment steers gained considerably less than the 1:13 steers which in turn were less than the 1:26 and 1:40 treatments. The latter two produced very similar gains.

The year round non-rotational grazing of couch at 1:6 has again given good results, although the couch appears to be giving way to grasses higher in succession.

The weaner mineral trials have shown that Cobalt Sulphate has a slightly depressing effect on gains while Monosidium Phosphate at the rate of one ounce per day has caused a highly significant increase in weight gains after one year. This group now weighs 80 lb./head more than the Control group. A further trial has been started with a new batch of weaners using one ounce of Monosodium Phosphate daily, half ounce and a contol.

Ecological Observations. (Red Sandy Loam). The response to fertilizer in the fertilized veld trial was substantially the same as in the previous two seasons, i.e. 1:2:4, control, medium application and high application respectively.

The seasonal graze plots still demonstrate clearly that a complete summer rest and winter grazing is beneficial to grasses and therefore retards bush encroachment.

Dryland Artificial Pastures on Red Soil. All were fertilized at the rate of 100 lb. of Superphosphate and 200 lb. Sulphate of Ammonia during the rains. The yields of hay were still good in the fourth season after planting. The highest yielder was creeping Makarikari at 2.07 tons/acre with Zeerust Cenchrus second at 1.86 tons/acre. The Gold Coast Napier had deteriorated to such an extent that it is to be replaced by Eragrostis curvula during the 58/59 season.

Crop Experiments and Trials. A maize fertilizer/espacement trial was run on the Kalahari sand and again there was no response to a 7,000 plant/acre range (7,000-14,000). There was a highly significant linear response to Nitrogen but no response to Phosphate.

In the black clay soil trials a Sorghum variety averaged 17.02 bags/acre.

A sorghum espacement trial showed that by reducing the between-row spacing from 36 in.-21 in.-6 in. increased the yield significantly. There were no significant responses to differing in-row spacings.

A wheat variety trial on the black soil was most encouraging, the average yield was 11.22 bags/acre.

A maize variety trial was run on the red sandy loam soil and the average yield was 16.71 bags/acre.

Of the other farm crops grown Salisbury Hybrid maize averaged 14 bags/acre on the sand and 15.7 bags/acre on the red soil.

Cowpeas, velvet beans and dolichos for hay averaged over two tons/acre.

Just over an acre of Ribboncane produced 22 tons of green matter for silage.

Umkouzaan (Dicapetalum cymosum). The plots which were sprayed by Mr. Cronin of Pest Control two years ago show that none of the herbicides tried gave a 100% kill with one application. In the plots where two spot-sprayed applications (24D and 245T) have been made there are still a number of surviving shoots.

A survey of the quarter-acre plots which were spot-sprayed with 0.75 per cent. aqueous solutions of 24D and 245T in July, August, September, October and November 1957 reveals that the later spayings were the best but none were completely effective and it would appear that three or four applications may be necessary to obtain a 100% elimination of the plant. Repeated spraying would be laborious and expensive.

TULI PASTURE SUB STATION

Development. One new experiment designed to study the effect on lowveld vegetation of heavy grazing and protection from grazing was laid out and stocked with steers. The first four plots of the new burning experiments were laid out. A new aborcide trial on the nearby Sengazane air strip was begun. Roads, fences, and gates were maintained in good condition.

Research. The veld management and bush control experiments were carried on as in the previous year.

The differences between the steer liveweights on the cleared one herd, three paddock grazing trial and the comparable uncleared grazing trial were striking and consistent. The average peak liveweight for the cleared experiment was 150 lb. greater than the peak weight from the uncleared experiment. Estimates of the yields of air dry grass in these two experiments were 2,882 lb./acre on the cleared and 660 lb./acre on the uncleared veld.

The differences between other systems of management or stocking rates were slight.

Further observations were made on the browsing and grazing habits of cattle and goats. Particular attention was taken of the relative importance of browse under different rates of stocking.

The preliminary large scale botanical survey of the experimental area was completed. Fixed point photographs were taken of all experiments and phenological observations on the vegetation were continued.

General. A new L.D.O. took over local control of the experiments on the 28th February. There was no shortage of unskilled labour.

Most of the rain fell in heavy showers during January, but the total of 15.98 inches for the year was about average.

No accidental fires occured during the year.

POULTRY SECTION

Development. A block of six breeding pens and an open shed to house the birds of the proposed egg laying test were completed and a laying house is under construction.

Battery growing cages were installed in the existing brooder house.

Experimental. The above development supplied sufficient accommodation for starting a number of feeding trials and improved breeding.

These studies included a trial to determine to what extent slightly charred milk powder could be substituted for animal protein such as meat and fish meal. From the results obtained it may be concluded that six pounds of charred milk powder can successfully replace four pounds meat and fish meal without any detrimental effect on growth rate of New Hampshire chicks.

Other trials included the study of feeding a high level of Terramycin to breeding stock and its long-term effect on fertility, hatchability and growth rate on the progeny of birds so fed. This experiment is still in progress.

As a result of heavy losses of chicks kept in cages, experienced by farmers, observations on similar cages and the same strain of New Hampshire birds were made at this Station. These observations indicated that management and lack

of knowledge of this type of housing may be the cause of heavy mortality. But the data collected so far are unconclusive and further studies are planned before any recommendations can be made.

Records of performance, egg weight and body weight of all pullets on the Station are kept to assist in the breeding of a high class New Hampshire strain for ultimate distribution of cockerels amongst farmers to improve their own stock.

General. During the year 75 farmers were visited. Advisory work is severely curtailed due to the low mileage allocation in relation to the area to be covered.

Sixty farmers visited the Section and numerous telephone calls and letters were received and replied to.

Fifteen Committee and Association meetings were attended.

The Poultry Officer officiated as a judge at the Salisbury, Gutu, Gwelo and Bulawayo Agricultural Shows.

An exhibit was staged at the Bulawayo Show.

The Bulawayo and District Poultry Association has been active throughout the year endeavouring to solve marketing and other problems of the poultry industry. A commercial egg laying test fostered by the above Association is planned at the Station.

The increase in price of mealie meal with a resultant increase in price of balanced rations is having a detrimental effect on the income of genuine poultry farmers who already have a battle to stay solvent.

REPORT OF THE SABI VALLEY EXPERIMENT STATION

W. H. WILLIAMS
OFFICER-IN-CHARGE

GENERAL

The year under review has seen a change of organization and Station conduct to allow for continuation and expansion, in both field and laboratory, of the essential and fundamental work on water requirements and the effects of water and crops on soil physical conditions. The approach to the agronomic experimental method also was revised to permit concentration on fewer and more critically designed experiments; this has allowed detailed observations to be made and substantially more measurements and records to be taken.

The necessary close liason between field and laboratory was maintained and considerable progress in the fundamental research has been made.

It is recorded with regret however, that due entirely to lack of staff, the Animal Husbandry/Pasture Section existed on a care and maintenance basis only, and no experimental work whatsoever was possible.

WEATHER

Compared with last year, weather conditions were particularly favourable for irrigation farming. Rainfall was above average and well distributed, resulting in few irrigations being required for the main plantings of maize and cotton. Evaporation during January and February was much lower than for the corresponding period last year, thus reducing the chances of wilting during the critical period of crop growth.

STATION DEVELOPMENT

No major works were carried out, and the opportunity was taken to clear Station boundaries and paddocks of existing and regenerating bush, to uncover and clean out drainage systems, to regrade and repair them where necessary and to find suitable water disposal areas which later could be used for rice cultivation. The farm area was ring-fenced and the night storage dam deepened to double capacity. A section of Acacia land was graded and prepared for Irrigation Efficiency work and the necessary gates and water measuring devices installed; a section of virgin C-class land is being similarly prepared.

The Metreological site was enlarged to allow for the installation of potential evapotranspiration units.

A small extension to the Laboratory block was built to include a Wash-up/Furnace room and a Kjeldahl/Evaporation room, which, when equipped, will provide the facilities required for further chemical work.

STAFF

The staff position remained satisfactory following a number of replacements, except in regard to Animal Husbandry. The post of Animal Husbandry Officer was deleted from Station establishment and the Technical Assistant post, which fell vacant at the end of January, was not filled. The Soil Physicist returned during March from study leave in the United States.

FIELD CROPS RESEARCH

Maize: Except for a preliminary study of planting methods, the trials conducted were confined to repeats as called for, of previous work.

A comparison of land preparation methods of rotavating, discing and ploughing with and without subsoiling, which included incorporation of crop residues, in this instance, sunnhemp, failed as in previous years to show significant yield differences between treatments, the average yields for the various cultivation methods being fairly constant around 27 bags grain per acre. It is suggested that the amount of hand work and consequent trampling which must be carried out to level small plots following cultivations, particularly ploughing, may vitiate any effects which the various methods of soil disturbance might have on crop growth, and this may be a reason for the statistically insignificant results from this trial to date.

Fertility studies on maize were repeated in a trial testing heavy applications of nitrogen (with and without phosphorous), in the presence and absence of crop

residues, and in an experiment designed to examine the response of maize to various nitrogenous fertilizers including kraal manure.

The former again failed to reveal differential yield differences; a poor response to heavy dressings of nitrogen was observed under the particular conditions of soil and high stand, and there was no response whatsoever to phosphorous. The experiment as designed is unlikely to give the information required—namely, "where nitrogen response stops"—and is to be abandoned in favour of studies on the effects and inter-actions of water, nitrogen and spacing levels.

In the Nitrogen Sources trial, ammonium sulphate again proved to be the best source of nitrogen; the results however also revealed a significant response (on Acacia soil) to the kraal manure treatment, which suggests that factors other than nitrogen supply and availability are limiting yields on these older soils. One of these factors may be the very poor water holding capacity of the sandy top layers, which situation may have been improved by the dressing of manure

A planting trial was conducted to compare various mechanical methods with the one presently used of planting dry and irrigating up, the object being to effect an economy in irrigation water applied and/or an increase in stand percentage Maize was planted between ridges in dry soil, irrigated up; in barley stubble about three inches deep in moist soil; three inches deep in a moist rotavated seed bed and by the usual method on a rotavated seed bed followed immediately by an irrigation. Borrowed John Deere units were used and some difficulty was experienced on small plots in the use of these units designed for commercial planting. Although no significant differences between either grain yields or stands resulted, some valuable observations were made.

The highest yield of over 25 bags was obtained from the furrow planted maize. This method of planting precludes the fine levelling necessary for efficient application of water by the flood method and also required much smaller quantities of water per irrigation, a considerable advantage under conditions of uncertain rainfall. Planting deep in a moist rotavated seedbed, provided drying out is not too intense, may effect a saving of one irrigation, avoid the soil crusting problem after seeding and result in decreased weed growth in the early stages. Planting deep in uncultivated barley stubble required an irrigation shortly after planting possibly because of drying out due to heavy weed growth, and subsequent control cultivations by comparison proved to be costly. Pre-emergence spraying however, could be used with this as with other methods of planting maize.

Maize breeding: Work concentrated on bulking up the inbred components of the hybrids found to have shown considerable promise at Sabi and elsewhere, and on further hybrid seed production. Inbreeding was continued in the Canary Isles dwarf material and the S. American rust resistant lines. Streak-resistant lines were imported from the Union and grown in isolation for observation and inbreeding.

Cotton: Very satisfactory cotton yeilds were obtained in general, but insect damage was high resulting in a higher percentage of stained lint and consequently lower grades. In all probability this reflects poor application of insecticide, caused partly by rain interference and partly by inadequate supervision of spraying due to lack of staff during the early stages of protection.

Apart from breeding and selection work conducted on behalf of Gatooma Research Station, cotton was planted in a farm-scale rotation and in a spacing and Nitrogen trial.

The rotation cotton followed wheat on two half-acre blocks and yielded at rates of 1,850 and 1,650 lb. seed cotton per acre. Growth was very satisfactory but insect control poor, accounting for the relatively low yield.

The spacing and nitrogen trial was designed to allow for one replication on Acacia soil and one on Mopani; three between-row spacings, three within-row spacings and three application rates of nitrogen were studied in all combinations following a basal dressing of nitrogen fertilizer to all plots. Results indicated that neither main effects nor interactions were significant on Acacia, where the mean yield amounted to 2,216 lb. per acre seed cotton, and on Mopani only the main effect of nitrogen was significant ($P=0.05$), the mean yield being substantially higher at 3,025 lb. per acre.

This work confirms that cotton planted in 42 inch rows and thinned to four to nine inches in the row, should give maximum yields for present varieties in large-scale plantings. As observed with other crops also, it is to be noted that the heavier and more water retentive Mopani soils are capable of considerably

higher yields of cotton under the present methods of irrigation and fertilization, and it has now to be ascertained whether these enhanced yields are due to reduced insect attack or to more favourable conditions of water and soil for plant development.

Breeding and Selection: Strain selection trials (6) were conducted as in previous years on behalf of Gatooma Research Station, and full details of results will be reported by that Station. These trials were conducted on the Mopani farm. Growth habit of certain of the better lines was short, compact and well suited to irrigated conditions, and some exceptionally high yields were recorded. In Progeny Trial One for example, the two best lines gave just over 4,000 lb. seed cotton per acre compared with just under 3,000 lb. from G52/36 and 2,700 lb. from the commercial variety 9L 34; and in the Small Bulks Trial, the top yield was 3,850 lb., compared with 3,280 lb. from 9L 34 and 3,780 from G52/36.

Wheat and Barley: Although rats and especially Quelea caused very considerable damage to wheat and barley trials, despite elaborate precautions, some satisfactory yields and indications of yields were recorded, and a good deal of valuable information of a research nature obtained which has thrown considerable ligth on certain agronomic factors which heretofore had remained anomalous.

It is known that the rat population of the Valley builds up to plague proportions only in certain years, and this problem would probably become non-existant following extensive bush clearing. The Quelea problem however, is much more serious and must be tackled on a nation-wide basis.

Over 100 varieties and selections of *wheat* were planted for either seed increase or further selection, and of these, 22 selections were sent to Salisbury for summer planting this year, and a further 19 retained at Sabi for testing next season.

Both lodging and rust resistance appear to be closely correlated with soil nitrogen fertility status and density of stand, which would indicate that wider row spacing may be advantageous in certain cases.

Strains selected last year at Salisbury and Sabi for high degree of rust resistance have performed very satisfactorily, and assuming there is no breakdown of resistance in the future, it can be said with some confidence that *stem rust* is no longer a major limiting factor at Sabi.

A variety trial, which promised interesting and good yields, was so severely damaged by birds that the mean yield only amounted to seven bags per acre. Two of the Plant Breeder's selections however, yielded over ten bags clean grain (10.3 and 11.9 bags respectively); both are short-strawed and appear to be well adapted.

A nitrogen trial, associated with various cropping treatments, failed to give significant yield differences mainly, it is believed, because of bird damage. Stand counts at harvest indicated beneficial effects both from basal and from later fertilizer applications up to 60 lb. *N* per acre in each case. Response to nitrogen however, was not as great as would be expected from the low nitrogen status of Sabi soils, and it is felt that soil moisture studies will provide reasons for this comparatively low response and suggest methods of improving on it.

Rust resistance grading revealed a steady increase in severity of stem rust with increasing nitrogen application, but from examination of the grain produced it would appear that even the most severe rust attack recorded has not significantly decreased grain size and hence yield.

A trial to investigate chemical control of rust using Dithane on late planted Burbank, revealed that both leaf and stem rust were almost completely suppressed by frequent spraying. Although probably not of practical value Dithane may prove particularly useful in estimating crop loss due to leaf rust, about which little is known at present.

A timing of nitrogen application study indicated that plots which received 30 lb. *N* each at tillering and boot outyielded those given the full dressing at the boot stage—the standard practice so far. The poorest result, rather unexpectedly, was recorded from plots receiving 20 lb. *N* each at tillering, boot and bloom.

Planting date for wheat was re-examined comparing a reputedly rust-resistant Angola variety (X1) with the highly susceptible Kenya Governor. Under conditions of dense stand and high nitrogen fertility, the resistance of X1 was disappointing but the rate of fall-off in yield was still much lower than that shown by Kenya Governor, suggesting that in the past, later plantings may have suffered yield decrease due mainly to rust attack rather than to changing climatic conditions.

Spray and flood methods of irrigation, and a combination of the two, were examined in observation plots. Spray + flood plots received 12.7in. water and yielded 14.8 bags grain; the flood method required 17.5in. water and gave 12.7 bags grain whereas the overhead method, which put on ten inches of water, returned the somewhat lower yield of 11.6 bags. The low water application rate required under these conditions to produce a crop of nearly 15 bags grain per acre is of particular interest in view of the requirements of an adjoining farm-scale wheat plot where 36in. had to be applied under border-check irrigation.

Barley Trials also suffered severly from Quelea damage, the birds moving in as soon as the ears opened.

In a variety trial in which 16 varieties were tested including the local brewer's strain, Atlas California and Arivat both yielded at the rate of 18 bags per acre against 14 bags from the commercial variety.

Yield results from the "structure plots", where an indicator crop of barley followed various cropping treatments, are not yet available but the field observations indicated a marked improvement in growth following dhal, compared with that following continuous grain, Cotton/sunnhemp rotation and lucerne/grass mixture.

Lucerne: After some years of testing, the American variety Caliverde has been selected as most suitable for the conditions and best adapted to the area Planted at a high seeding rate, this variety establishes quickly, makes very rapid growth and continues to give high yields of excellent material on both small and farm-scale plots.

Lucerne trials planted during the 1958 season include date-of-planting, times of cutting, fertilizer and water status experiments. It is as yet too early to report results, but a marked response to heavy dressings at planting of single superphosphate has been observed on a section of the oldest Acacia lands, and significant yield differences were recorded at first cut in a trial designed to test the effects of soluble calcium.

Preliminary work was initiated on a comparison of the efficiency of spray and flood methods of irrigation, and of a combination of the two.

Miscellaneous Crops

Experimental and observational plantings were made and/or continued on the following:—

Bananas: A fertility study on the Mopani farm yielded at the rate of 15 tons per acre during the first year following initial bunch production; differences between fertilizer treatments are not yet apparent.

Production from the original planting, now in its sixth year, is rapidly falling off in quality and bunch size.

Pineapples: A small planting of Queen and Cayenne pineapples showed a marked response in vegetative growth to deep soil disturbance as compared with land preparation to three to four inches by rotavator before planting. These plots were planted late September 1957; at present flowering is prolific and heavy yields are anticipated.

Groundnuts: A variety trial and a methods-of-planting trial yielded very poorly after late planting and heavy rosette damage; there was an indication that furrow-planting was superior to planting on the ridge.

Dahl and Castor Beans: A number of grain dhals obtained from Grasslands set a heavy seed crop at a height of four to five feet; it may be that this material could be mechanically harvested and treated as a grain cash crop.

"Dawn" castor, a strain recently developed in the States specifically for irrigated conditions, was planted in an observation plot along with Dwarf Maunthers Spineless. The new introduction exhibited true dwarf characteristics under Sabi conditions, and poved to be non-shattering and substantially disease resistant. It set a later crop than Maunthers Dwarf; first candles were produced high on the plant and probably could have been successfully harvested by machine if dried off.

Fibres other than Cotton: Of the six Hibiscus cannabinus varieties planted early in observation plots, Cuba 108, Cubano, Formosa and Java proved most promising; in high stand they were unbranched, very nearly uniform and flowered

late and high on the stem. Late planting (January) of these varieties ensured good seed production at a height of three to four feet.

A late-planted fertilizer nitrogen trial using so-called Cuban seed, yielded very poorly, no response to nitrogen being obtained. The importance of early planting for rapid growth and poduction of long fibre was confirmed in a preliminary pot trial.

After a slow start, *Urena lobata* grew out well and produced a long, fine stem which appeared to be suitable for machine decortication. The fibre from this plant proved to be of excellent quality.

ROTATIONS AND GREEN MANURING

This season's results from the five-year rotation, Mopani farm, showed that both plant stand and yield of maize were significantly affected by previous cropping history. Plots in the first and second years of cash cropping following three-years lucerne yielded at the rate of 28.8 and 26.1 bags grain per acre respectively, whereas the continuous grain plots produced only 23.3 bags. All maize plots received substantial amounts of nitrogen, and these results suggest that the yield increases are due more to improvement in soil physical conditions by the lucerne break, rather than a direct nutritional effect due to fixation of nitrogen by the lucerne.

A short-term trial rotation on Acacia, in which maize or cotton follows a grain crop or green manure, with split plot nitrogen applications, has been running since 1954 without showing any marked yield response to green manuring. This year the indicator crop was Krug maize following either millet for grain or sunnhemp green manure. There was again no response to green manure but a most marked response to nitrogen.

A similar trial conducted on the Mopani farm showed a response to green manuring only when nitrogen was withheld from the maize.

LABORATORY AND SOIL RESEARCH

Investigations are presently concentrated upon the relationships between soil water and crop production under irrigation on the various soils in the experimental area. Considerable work also is done on the structure of the soil as it affects water movement, root penetration, seedling emergence and the benefits of perennial crops such as lucerne and dhal.

Methods for Soil Physical diagnosis: Soils of the Sabi Valley alluvium area have unusually poor structure. Various methods have been used to measure structure, including apparent density, aggregation tests, modulus of rupture, air:water permeability ratio and macroporosity measured on a tension table. Of these the most useful appear to be the air:water permeability ratio and macroporosity, both of which are capable of adaption to routine analysis.

Permeability to water has been tested both in the field using infiltration rings and in the laboratory by the hydraulic conductivity method.

The measurement of soil water status has been confined to direct sampling for soil water concentration and tensiometers for soil water suction. With much improved facilities, it is possible to handle up to 650 gravimetric determinations per week.

Equipment is now available for obtaining soil water retention curves, which have demonstrated greatly different water retention values for the local soil groups and have permitted approximate conversion to be made from soil water concentration to suction for experimental plot samples.

Gypsum blocks are being manufactured to permit measurement of soil water suction in excess of one atmosphere; the jetting technique for installation of piezometers has been demonstrated and a simple electrical sounder built for the detection of a water table.

Soil Studies: Numerous profiles from Class S, A and C areas have been analysed using physical methods.

Examinations of profiles from Chisambanji, Chibuwe and Sabi Tanganda Estates have demonstrated the properties of soils developed on basalt, riverine alluvial deposits and heavy eluviated sediments respectively.

In regard to Station soils it has been found that the topsoil of much of the Acacia area has very poor water retention and that frequent irrigations are

required during germination and emergence if soil water suction is to be kept down to a reasonable level. The poor stands and tillering of wheat on these soils may be attributed to this effect. Also, although the water holding capacity generally increases with depth, the total available water in the root zone is still very low; in a particular profile a figure of only 4.5 inches available water was found for the 0-52 inch depth.

After a four year period the effect of maize/wheat, cotton/sunnhemp, grass plus lucerne and dhal crop treatments on soil structure was examined. Differences between treatments were not significant ($P=0.05$) for infiltration and bulk density, but significant differences were obtained for macroporosity both between treatments and between depths; dhal showed a significant higher macroporosity than other treatments between which there was no significant difference. During the winter all plots were planted uniformly to barley, and noticeably improved growth was obtained on the ex-dhal plots.

Evaporation and Evapotranspiration: Evaporation losses from an Australian pan and from a black Bellani plate atometer are being measured. It is expected that the atometer will show a much higher correlation with evapotranspiration than that obtained from the open water pan. Weekly sampling to 42in. has been carried out on a half-acre wheat plot, and the pattern of water withdrawal obtained.

A series of observations of the duration of dewfall was made.

A plan has been drawn up in conjuction with the Agrometeorologist for three potential evapotranspirometers which will be installed shortly.

Irrigation Efficiency Examination of irrigation efficiency on 800 ft. x 30 ft. plots on a grade of 1 : 500 on Class A soil has continued for wheat and lucerne. Where border irrigation has been used with a six cusec stream the results have conclusively shown that this system is using excessive quantities of water. It has proved impossible to apply less than six inches per irrigation once the crop is established. A detailed experiment has been laid out to test whether efficiency can be improved by increasing the grade and reducing the length of run.

Preliminary tests on furrow irrigation have shown the usefulness of this method in reducing water losses by deep percolation.

In order to test the irrigation efficiency and general crop production on Class C Soil, a new area of eight 550 ft. x 15 ft. plots has been prepared. Infiltration, hydraulic conductivity, water retention, pH and salt concentration are being determined on samples from 18 profiles examined in this area.

Preliminary tests have been made on two plots of the Development Farm and the amounts applied have been found to be extremely excessive for soils of such low available soil water. This should be much improved by the use of furrows.

REPORT OF THE FEDERAL DEPARTMENT OF CONSERVATION AND EXTENSION FOR THE YEAR 1st OCTOBER, 1957 TO 30th SEPTEMBER, 1958.

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REPORT OF THE FEDERAL DEPARTMENT OF CONSERVATION AND EXTENSION FOR THE YEAR ENDING 30th SEPTEMBER, 1958 SOUTHERN RHODESIA

1. ORGANIZATION

The general staff position of the Department remained the same throughout the year, and the work of the Department carried on smoothly, albeit at high pressure for most of the time.

(a) Head Office

The administrative staff were strengthened by the addition of a post in the Records Office, and this, coupled with the fact that there were very few changes in the personnel, led to greater efficiency in the performance of their duties.

During the year the following posts were upgraded and this will have a very important and beneficial effect on the work.

1. Farm Machinery Adviser
2. Farm Buildings Adviser
3. Senior Agricultural Topographer
4. Vlei Drainage Engineer

Despite extensive advertising, the post of the Vlei Drainage Engineer remained vacant for the full year. The post was of necessity upgraded, and a suitable local applicant found who took up his appointment on the 1st October, 1958.

(b) Regional Offices

All clerical posts in Regional offices are now filled by male officers two of whom are established staff. The position has therefore improved and with further experience the officers concerned should be able to assist the Regional officers to an increasing extent. The office work at Regions has, however, increased and it is becoming apparent that further assistance will be required in the near future.

Further, African clerks were appointed at Group offices and with the exception of two offices, all Groups now have either African clerks or part-time European clerical assistance. This was a notable improvement in the position at Group Level and the technical officers can therefore devote more of their time to field duties.

(c) Intensive Conservation Areas

With the development of newly alienated farms in areas adjoining the Umvukwes Area, it became necessary to declare an additional Area, the "Horseshoe" I.C.A.

The present position in regard to I.C.A.s is as follows:—

(i) Declared during the year—Horseshoe I.C.A.

(ii) Investigated or under investigation for declaration—The entire European farming area has now been proclaimed, and when new areas are opened up for settlement these will be included in existing I.C.A.s or declared separately.

(iii) Sub-divided during the year—North Maquadzi was sub-divided into two I.C.A.s, now known as North Ayrshire and South Ayrshire.

(iv) Investigated or under investigation for sub-division—Nil.

(v) Boundaries changed—Umvukwes, Marodzi-Tatagura, Mchingwe, Filabusi, Belingwe, Sebakwe, Insiza, Headlands, Macheke, Mtoko Nyandora.

(vi) Investigated or under investigation for changes—Ncema, Insiza, Macheke, Wenimbi, Shangani, Inyati, Bubi, N. Matopos, Figtree

(vii) Areas declared—Altogether 93 I.C.A.s have now been declared in Southern Rhodesia.

The position in regard to I.C.A.s, Groups and Regions is now as follows:—

Region	*Group*	*I.C.A.*
MASHONALAND	Salisbury	Gwebi Hunyani
		Salisbury West
		Norton
		Salisbury South
		Arcturus
		Ruwa
		Beatrice
	Marandellas	Wenimbi
		Marandellas South
		Wedza
		Bromley
		Marandellas North
		Marandellas West
	West Hunyani	Angwa South
		Angwa North
		Doma
		Karoi North
		Karoi South
	East Hunyani	Darwendale
		Trelawney
		Banket
		Eldorado
		Ayrshire North
		Ayrshire South
	Mazoe	Umvukwes
		Horse Shoe
		Darwin
		Glendale
		Marodzi-Tatagura
		Bindura
		Shamva
MIDLANDS	Gwelo	Gwelo
		Gwelo East
		Selukwe
		Vungu
		Upper Ingesi
	Victoria	Umshandige
		Victoria Central
		Victoria East
		Chiredzi
		Nuanetsi/Mtilikwe
		Sabi Valley
	Charter	Featherstone
		Enkeldoorn
		Gutu
		Umvuma
		Tokwe
		Chatsworth
	Umfuli	Umsweswe
		Suri Suri
		Sokis
		Umfuli
		Selous
		Gadzema
	Que Que	Battlefields
		Umniati-Sebakwe
		Bembezaan
		Sessombi
Eastern	Mid-Eastern	Mayo
		Macheke
		Nyandora
		Mtoko
		Headlands
		Rusape
		Odzi
		Tsungwesi
	Eastern	Inyanga
		Umtali North
		Umtali South
		Cashel
		Melsetter
		Chipinga
MATABELELAND	Gwaai	Bubi
		Inyati
		Lower Umgusa
		Upper Umgusa
		Lower Khami
		Upper Kahmi

Region	*Group*	*I.C.A.*
	Shangani	Mchingwe
		Insiza
		Shangani
		Ncema
	Umzingwane	Gwanda
		South Matopos
		Filabusi
		Belingwe-Shabani
		Limpopo
	Western	Figtree
		Matopos North
		Marula
		Plumtree
		Gwaai
		Matetsi

(d) **I.C.A. Committees**

Througout the year I.C.A. Committees maintained their interest in the development of conservation farming in their areas. With the development of farm planning it became very important for Committees to assist the Conservation Officers in the careful planning of their programmes of work. In most areas this is now well organised and has resulted in an increased output of work in all respects.

During the year Committees organised numerous field days and visits to farms and research stations, which stimulated interest in better farming and good land-use. In many instances Committees actively supported and assisted in carrying out valuable field trials in their areas. A considerable amount of time was also devoted to the problems of African settlement and cultivation on European farms and ranches and on mission stations, and definite progress can be reported for which the Committees deserve a lot of credit. In a number of Areas, Committees are also organising the campaign for the control of bilharzia and liver fluke.

(e) **Group Organization**

The various Groups functioned in a satisfactory manner and Group Committees contributed considerably to bringing about a co-ordinated approach to the work of Committees and to solving major problems within Groups.

Through the Group organization close liaison has been established with other Services such as Irrigation, Roads and Native Affairs to the benefit of all concerned. Very much closer co-operation was also brought about with local Farmers' Associations, by the Group Chairmen and the Committees.

2. STAFF

(a) **Establishment**

The only alteration in the establishment of the Department during the year was the approval of an additional post for the records section at head office.

In the professional and technical field very few resignations occurred, and from a waiting list of suitably qualified men it was possible to fill these vacancies. It was not possible to fill the post of Irrigation Officer caused by the resignation of Mr. Newbold. This post, being a specialised one carrying considerable responsibility, is not attractive at its present grade.

The following table gives the establishment of the Department:—

	Authorized 30.9.57	*Authorized* 30.9.58	*Requirements*
Administration (including Professional Staff at Headquarters)	15	16	16
Regional Clerical Staff	9	9	9
Regional Conservation and Extension Officers	4	4	4
Additional Regional Conservation and Extension Officers	4	4	4
Group and Additional Group Conservation and Extension Officers	27	27	27
Conservation Officers	84	84	93
Chief Conservation Engineer	1	1	1
Conservation Engineers, Erosion Research	2	2	2
Farm Machinery Advisory Engineer	1	1	1
Farm Buildings Advisory Engineer	1	1	1
Vlei Drainage Engineer	1	1	1
Mechanical Engineer (seconded from C.M.E.D.)	1	1	1
Irrigation Officers	2	2	2
Young Farmers' Clubs Organisers	2	2	3
Chief Tobacco Extension Officer	1	1	1
Tobacco Extension Officer	1	1	1
Chief Planning and Training Officer	1	1	1
Senior Planning Officer	1	1	1

	Authorised 30.9.57	*Authorised* 30.9.58	*Requirements*
Senior Training Officer	—	—	1
Senior Agricultural Topographer	1	1	1
Agricultural Topographers	5	5	6
Animal Husbandry Officer	1	1	1
Farm Managers and Assistants	4	4	4
Information Officer	—	—	1
Mechanical Unit Inspectors	6	6	4
Senior Horticulturist (seconded from Department of Research and Specialist Services)	1	1	1
Horticulturist (Contract)	1	1	1
Soil Chemists (seconded from Department of Research and Specialist Services)	2	2	2
African Conservation Assistants	22	22	26
African Survey Hands	116	116	120
African Clerks (Group Officers)	4	4	10
African Librarian	—	—	1
African Scribes	—	—	2
African Orderlies, Drivers, etc.	12	12	12
TOTALS	333	334	362

At the end of the year there was a total of 35 officers in the Department trained and qualified to advise farmers on tobacco production. Nine new officers were trained during the past season and eight others are now being trained.

The trained officers are stationed as follows:—

Southern Rhodesia 28

Northern Rhodesia 7

(b) **Visits to other Countries**

United States of America. Through the kind assistance of the International Co-operation Administration it was possible for four officers from Southern Rhodesia, namely Messrs. W. E. Collett, G. E. Rowe, N. W. Hudson, and K. S. Richards, to visit the United States of America for periods of four to six months to study land-use practices, conservation research and catchment protection methods. These officers will return between October 1958 and January 1959.

The value of these studies in the U.S.A. by selected senior officers of the Department is beyond question and there is no doubt that the officers referred to will bring back additional information to improve further our own methods and techniques in the interest of the country as a whole.

Moçambique. (i) The Director and Deputy Director attended the Sixth Meeting of Southern African Regional Committee for the Conservation and Utilization of the Soil held at Lourenço Marques during June, 1958. The meeting was followed by a tour of the southern portion of Moçambique which proved most interesting and instructive.

(ii) Mr. G. Turck, Senior Irrigation Officer, made a short visit to the irrigation projects of the Limpopo Valley at Guija and Inhamissa to study systems of irrigation and soil and crop management practices.

(iii) Mr. H. Templeton, Farm Machinery Advisory Engineer, and Mr. K. S. Richards, Additional Regional Conservation and Extension Officer, Umtali, visited the Kenaf growing areas between Umtali and Beira to study production and decorticating methods.

Swaziland. At the request of the Swaziland Government Mr. G. Turck, Senior Irrigation Officer, visited the area to assist and advise on the development of the Malkerns irrigation project.

Kenya. Mr. M. Cassidy, Senior Horticultural Officer, visited Kenya to study coffee production.

(c) **Departmental Committees**

The Director served on the following Committees during the year:—

(i) Federal Standing Committee on Agricultural Production.

(ii) Livestock Improvement Committee (Chairman).

(iii) Natural Resources Board of Southern Rhodesia (Advisory).

(iv) Cabinet Sabi Development Committee.

(v) Water Resources Committee of the Natural Resources Board.

(vi) Tobacco Research Board.

(vii) Kariba Lake Fisheries Committee.

(viii) National Parks Board.

(ix) Research Advisory Committee of the Department of Research and Specialist Services.

(x) Conservation Education Committee of Natural Resources Board.

The Deputy Director served on:—

(i) Land Settlement Board.

(ii) Sub-division of Land Committee of the Natural Resources Board.

(iii) General Purposes Committee of the Natural Resources Board.

(iv) Native Affairs Committee of the Natural Resources Board.

(v) Sabi Development Farm Committee.

(vi) Fibre Committee.

(vii) Mineral Resources Committee of the Natural Resources Board.

The Chief Conservation Engineer served on:—

(i) Inter-Departmental Committee on Hydrology.

(ii) Water Resources Committee of the Natural Resources Board.

(iii) C.M.E.D. Co-ordinating Committee.

(iv) Regional Water Development Committee.

(v) Sabi Catchment Advisory Committee.

(vi) Engineering Committee of the Department of Conservation and Extension.

The Chief Planning and Training Officer served on:—

(i) Sabi Catchment Advisory Committee (Chairman).

(ii) Nitrogen Committee.

(iii) Marimba Catchment Committee (Chairman).

(d) **Publications**

The Department was responsible for the preparation of the following papers and articles published in various Journals:—

	Title	*Author*	*Publication*
1.	The Ecology and Land-Use of the Belingwe I.C.A.	G. D. Goldthorp	R.A.J., Sept./Oct., 1957.
2.	Soil Erosion and Tobacco Growing	N. W. Hudson	R.A.J., Nov./Dec., 1957.
3.	Some Preliminary Indications of Soil Moisture Changes under Arable Crops	D. J. Jackson	R.A.J., Jan./Feb., 1958.
4.	Deciduous Fruit Production in the Eastern Districts	M. A. Cassidy	R.A.J., March/April, 1958.
5.	The Application of Air Photo-Analysis and Interpretation to Soil Survey and Land Classification	R. G. B. Jones	R.A.J., March/April, 1958.
6.	The Construction of Small Earth Dams	J. M. Cormack	R.A.J., May/June, 1958.
7.	Land-Use and Surface Run-Off in Rhodesia	N. W. Hudson	Paper to the International Seminar on Flood Control, Drainage and Irrigation, Czechoslovakia, April, 1958.
8.	Run-Off and Soil loss from Arable Land in Southern Rhodesia	N. W. Hudson	Paper to the 7th Technical Session International Union for the Conservation of Nature and its Resources. Athens, Sept., 1958.
9.	Tobacco Production Methods in America	C. Rose	Rhod. Tobacco Journal, March, 1958.
10.	Ploughing: Can we do a better job?	H. A. Templeton	Rhod. Tobacco Journal, March, 1958.
11.	Plan Before You Plant	C. Rose	Rhod. Tobacco Journal, Aug., 1958.
12.	The Value of Tobacco Forums	R. R. Graham	Rhod. Tobacco Journal, Aug., 1958.
13.	Maintenance of Farm Buildings	A. N. Pirie	Rhod. Tobacco Journal, Aug., 1958.
14.	Anthills on Sandy Soil are a valuable Asset	R. F. Shipman	Rhod. Tobacco Journal, Aug., 1958.
15.	Irrigation in Other Lands	G. Turck	Rhod. Farmer, Dec., 1957/March, 1958.
16.	Sheep on the High Veld	G. Westbury	Rhod. Farmer Jan./March, 1958.
17.	Aerial Photography in Agriculture.	R. H. Hack	Rhod. Farmer, Feb., 1958.
18.	Efficient Silage Making	H. A. Templeton	Rhod. Farmer, May, 1958.
19.	Make Use of your Dwalas	J. M. B. Smith	Rhod. Farmer, June, 1958.
20.	The Herring Bone Milking Parlour	A. N. Pirie	Rhod. Farmer, June, 1958.
21.	Barns and Ventilation	C. Rose	Rhod. Farmer, Aug., 1958.
22.	Burning Bricks with Coal	A. N. Pirie	Rhod. Farmer, Aug., 1958.
23.	Seedbed Management	J. M. Jameson	Rhod. Farmer, Sept., 1958.
24.	Soil and Water Conservation in Rhodesia	C. B. Metcalfe	Shell Digest
	Weekly Tobacco Bulletin	C. Rose, R. R. Graham and J. M. Jameson	

3. TRANSPORT

The transport position remained entirely adequate, and the authorized use of private vehicles is satisfactory and in the interest of the work.

Due to finances available it was unfortunately necessary that mileage allocations to officers be restricted, and this naturally affected the output of work.

With careful organization and planning it was, however, possible to attend to all urgent and essential duties.

The vehicle position is as follows:—

Authorised private vehicles	138
C.M.E.D. vehicles	25
Outstanding applications	12

4. EXPENDITURE

Vote 39	Federal Headquarters and Southern Rhodesia Item	1957/58 Authorized	1957/58 Actual	1958/59 Authorized and Anticipated Expenditure
A	Salaries, Wages and Allowances	233,699	236,482	250,352
B	Travelling and Subsistence	17,700	19,726	20,300
C1	Books and Periodicals	310	238	260
C2	Camping Equipment	50	25	50
C3	Experimental Equipment for Conservation Works	2,100	877	1,760
C4	Leave Entitlements	1,000	999	1,000
C5	Office and Miscellaneous	1,730	1,725	1,900
C6	Purchase and Upkeep of Instruments and Technical Furniture and Equipment	2,860	2,255	1,280
C7	Recruiting Expenses	900	1,018	600
*C8	Teachers Training Courses	Nil	Nil	200
C9	Water, Light and Sanitary Charges	1,250	1,465	1,300
D	Housing	8,000	8,357	12,000
E1	Conservation Works and Measures on European Farming Land in terms of Section 23 of the Natural Resources Act of Southern Rhodesia, 1941	4,000	4,553	5,180
E2	Grass Nurseries, Other Conservation Works and Measures and Field Trials	6,700	6,313	6,350
F1	Chipinga Experimental Farm	5,350	6,762	5,650
F2	Karoi Experimental Farm	5,250	5,062	7,200
G	Transport and Equipment	75,400	69,162	67,030
H	Farm Planning, Air Photography	5,600	5,049	3,330
J	Assistance to University Students:			
	1. Bursaries	1,500	1,575	1,650
	2. Loans	1,000	750	900
K	Transfer Adjustments	1	447	300
	TOTAL	£374,400	£372,840	£388,592

*Previously provided on Estimates of the Ministry of Education.

5. GENERAL AGRICULTURAL CONDITIONS

(a) Climatic Conditions—General

For the production of crops the past summer season was one of the most difficult experienced for many years. Good planting rains commenced late. These were followed by exceptionally wet conditions during January, February and the early cessation of rain. It can be appreciated that it was most difficult for both tobacco and maize farmers to produce satisfactory crops under such conditions.

In general, grazing conditions were good throughout the year and water supplies remained adequate.

(i) *Mashonaland.* Some early showers of rain were experienced but the general rains commenced only in December and continued virtually uninterrupted until the end of February and early March and then ceased abruptly.

The crops, particularly those that were late planted, were adversely affected first by the long periods of overcast weather and then by the lack of rain during March and April.

Temperatures were generally normal, although the winter was rather cooler with some heavy frosts in parts of Mashonaland.

(ii) *Eastern.* The season commenced with very erratic showers and with the exception of some areas such as Rusape and Umtali, the general planting rains were late. Excessive rain and overcast conditions prevailed until March which made conditions of management difficult and adversely affected the crops. Some well dispersed rains were received during the autumn and spring especially along the eastern border.

The winter was very cold with heavy frost during July-August, damaging peas and other crops. Hail damage during the year was very slight.

(iii) *Midlands.* The rainfall pattern for the Midlands was very similar to that of the rest of the country. Some early showers were experienced followed by a long dry spell with excessive rains later in the summer coming to a sudden end after two months. Conditions were therefore not favourable for crops except for certain sections of the area. Grazing conditions remained reasonably good with adequate water supplies.

The late winter was cold with some severe frosts in certain areas. The cold weather delayed growth in tobacco seedbeds.

(iv) *Matabeleland.* The season in Matabeleland started late and developed into a fairly extended period of excessively wet conditions which came to an abrupt end late in February. Agricultural production was adversely affected by the erratic conditions, although average yields were fairly good.

The winter was mild with the exception of a rather unexpected cold period which extended for over a week during the latter portion of the season. This spell was accompanied by widespread frost causing severe damage to crops.

(b) **Crop Production**

(i) *Food Crops.—Maize.* With the exception of some isolated areas such as Karoi, parts of the Midlands and Matabeleland, the maize yields were generally lower than the previous year. The main reasons for this were:—

(a) Late planting due to late rains;

(b) Poor stands;

(c) Inability of farmers to cultivate due to wet season;

(d) Sudden cessation of rains in February-March;

(e) Water logging and adverse soil conditions due to excessive rains.

In general there is a vast improvement in regard to soil and crop management throughout the country. In addition farm planning and soil classification are developing a growing appreciation of the need for and importance of land selection in the production of high yield crops of quality.

In the Umgusa Valley the maize crop was attacked by "Streak" disease (Zea virus 2) resulting in severe loss by the settlers. Very little damage was caused by insect pests and other disease factors.

Sorghums. Other than on two farms in Matabeleland, sorghums were grown only on a very small scale. The yields were generally low due to the adverse weather conditions.

There is still a general interest in this crop in the lower rainfall areas especially since the lowering of the maize price. It is confidently expected that with improved varieties and hybrids, which should be available from the Matopos Research Station in the near future, reasonable yields should be possible in areas where temperatures are high and rainfall erratic. Certain varieties are also very suitable for silage and fodder purposes and will probably be grown more extensively in the future.

Groundnuts. There is a definite growing interest in this crop, but due to weather conditions results were not encouraging in the major part of the country. The value of this crop is appreciated and with the present favourable price structure increased acreages will be planted.

An oil expressing and refining plant is now in operation in the Eastern Districts and this will probably encourage production in these parts.

In Matabeleland, the crop is grown largely for rations for labour and stock on dairy farms.

Legumes. The production of legumes is important for stock feed in the form of hay or as silage mixed with maize or munga, as well as for green manuring and crop rotation purposes in the maize belt. Due to the unfavourable season there was a marked reduction in the acreage under legumes. The value of legume hay is generally accepted by stock owners and it is to be expected that an increased acreage will be planted during the coming year in most parts of the country.

Dahl (Cajanus indicus) is becoming a more popular legume in the frost free areas as a fodder crop, either in conjunction with permanent pastures or in pure stands. It is unfortunately an eelworm host and cannot be recommended for tobacco rotations.

Several other legumes such as Jack Bean *(Canavalia ensiformis) Desmodium, Crotalaria intermedia* and *Crotalaria ochraleuca* are being tested out by farmers on an increasing scale as fodder and/or green manuring crops.

Potatoes. Only very limited acreages are now grown as a dryland summer crop, due to disease factors. The yields from this crop were generally low as a result of the unfavourable conditions.

As an irrigated crop, potatoes are still very important in the Salisbury and Umtali areas, as well as in parts of Matabeleland, Midlands and Mazoe Valley. In general these irrigated crops were successful and yields reasonable. With the introduction of new varieties and improved management techniques, results should be even better in future.

There is an increased interest in the production of certified seed potatoes in the Eastern Districts and this is of great importance to the industry and more satisfactory than the continuous importation of seed.

Wheat. It is pleasing to report a slight increase in the acreage under dryland winter wheat on the moisture retaining Kalahari soils of the Charter Group.

Under irrigation the crop is still not popular, although some very fine crops were grown during the past winter with yields of 12-15 bags per acre. As a result of the breeding work in progress it can be expected that better and higher yielding varieties should become available in due course, which will undoubtedly result in increased production.

Quelea were more active this year and in some parts the damage to wheat and other crops was extensive. The control of these birds is a matter requiring urgent attention, otherwise the production of wheat, as well as other cereals, will become impossible.

Barley. A fairly reasonable crop was produced, and the acreage under irrigation remains fairly constant. The crop is a popular irrigated crop but production is limited to the quotas and requirements of the Breweries. As a result of the cold winter conditions very little aphis damage occurred. Quelea, however, caused considerable damage to crops in most areas.

Vegetables. With the exception of the Eastern Districts vegetable production is mainly confined to small holders in the vicinity of the larger centres. Due to improved methods and an expanding market, however, overall production is increasing.

In the Eastern Districts there has been a very definite improvement in production methods, grading and marketing due to the advisory assistance of the Horticultural Officers, better organisation of growers and processing facilities at Umtali, Cashel and Chipinga.

Green peas for the factories is the most popular crop and production was almost double that of the previous year.

Some 1,500 tons of green beans were produced for the factories during the past season and the crop is most profitable as well as valuable in rotation on an intensive basis. Unfortunately, the market for the processed product is limited, hence the price has been reduced by £5 per ton for the next crop, and this, in turn, will result in decreased plantings.

There was a considerable increase in the production of tomatoes, and with a limited market demand the prices were much below the previous year. However, in the frost free areas, tomatoes will remain a profitable crop especially with improved varieties, production and marketing methods.

There is an increased interest in the production of onions and growers who managed to market their crops during August received good prices. The demand

is regrettably limited and over production soon results with a consequent drop in price.

Fairly substantial cabbage and cauliflower crops were produced to satisfy the demands of the fresh market and the factories. Dairy farmers also made good use of the leaves of cauliflowers as feed for the cows, when the crop was harvested.

Because of a drop in the price of sweet corn production decreased considerably.

In spite of the increased interest in vegetable production, large quantities are still imported from the Union of South Africa to meet the demand in the Federation during certain times of the year. Local producers are therefore in a favourable position to supply this demand on an organized production basis.

Fruit.—Sub-tropical. An increasing number of farmers are planting citrus in the Eastern Districts, as well as in the Midlands. Not a few of these small orchards are bringing in a useful cash return, where management is efficient. It is felt that citrus could be grown on a larger scale in Matabeleland where irrigation is available and soils and climate suitable.

The Hippo Valley Estates in the Fort Victoria lowveld have made good progress and some 40,000 trees have been planted. Once the Kyle dam and irrigation canals are completed there should be considerable expansion in this area.

There has been no significant increase in plantings of pineapples, but carefully managed crops gave satisfactory returns.

Bananas were produced on a reasonable scale, especially in the Eastern Districts, and improvement in management was encouraging. Increased production to meet local requirements is expected during the next few years.

There was greater interest in avocados and where orchards are well managed and fruit properly marketed the returns were good.

A number of litchi trees were planted in frost free areas and will be watched with great interest, as a reasonable market could be established for this fruit.

Paw-paws and guavas are popular in the Eastern Districts and the factories took the bulk of the production this season. Plantings of selected varieties were made by some farmers.

Deciduous. There has been a positive improvement in the production and marketing of deciduous fruit in all areas and more especially in the Eastern Districts where advice is available from the local Horticultural Officers and climatic conditions particularly favourable.

The apple crop was generally light, but improvement in quality and marketing can be reported. The restriction on importations from the Union made a big difference to local producers and revived interest in better production. Although bitter rot and other minor diseases were still reported, there is definite improvement in production with the increased use of sprays and better orchard management.

Peaches are becoming more popular and increased plantings were made under the direction of the advisory officers. The demand for canning peaches by the factory is considerable and a good market exists for fresh fruit in the Federation. Some damage was caused by fruit fly in the Cashel area.

A reasonable crop of plums was harvested and good prices obtained as importations were again restricted while local fruit was available. The rains caused some damage to the late fruit.

There is a greater interest in vines and several farmers are planting small areas. The cost of trellising is one of the main stumbling blocks at present. In the Rusape and Umtali areas the production of wine is proving successful and will no doubt lead to further interest in vines. Anthracnose and mildew have been controlled by regular spraying.

(ii) *Cash Crops.—Tobacco: Flue-cured.* Seedbeds for the 1957 plantings grew well and were ready in good time for the long period of dry planting that was necessary due to the late arrival of the rains. With the improved seedbed techniques the seeding rate used by most farmers proved much too high, leading to the production of etiolated unsuitable plants which were difficult to harden off. These dense beds made the control of anthracnose more difficult than would be the case had the beds been more open. Since anthracnose is the most general and serious disease of seedbeds every effort must be made to ensure its complete control. The occurrence of anthracnose led to an increase in the use of methyl bromide for fumigation with excellent results in general. The other outstanding

feature in seed bed management was the high incidence of cupping due to the application of too little water at each watering and to over frequent applications, i.e. too many light waterings.

Land Selection and Preparation. Though the standard of land preparation continued to improve many crops still suffered from the failure to secure a deep, reasonably fine tilth before ridging. The lands selected for tobacco were well drained, and less second year and generally unsuitable land was used than in previous years.

A feature of the season was the poor results obtained on soils with heavy underlying subsoils. The need to avoid early ploughing on these soils was forcefully demonstrated. Where there was poor road alignment and inadequate drainage, farmers had great difficulty transporting tobacco from the lands to the barns during the months of January and February. This aspect of farm planning, if neglected, can lead to the loss of much valuable leaf at a critical time.

The fertilizer recommendations of the Tobacco Research Board have now gained very wide acceptance as a result of successful experience in their use. In some areas the quantities of Phosphate and Potash advised were exceeded, growers claiming benefit in the resulting quality of the leaf.

Field Management. Due to the general late start of the rains a large percentage of the crop was planted out with water. On the sandy soils late October plantings stood the long dry spell extremely well and, from the experience gained during this adverse year, two pints of water at planting were proved sufficient to carry the crop through on early ploughed sandy soils. The use of insecticides on early planted tobacco was largely responsible for the successful stands that were generally obtained.

The operations that are required up to the time reaping begins were on the whole well done. However, when the pressure of reaping was on, cultivation of the later planted tobacco and suckering were neglected. There was here more evidence to support the need for the reduction of the acreage grown, to that which the labour can adequately handle.

Reaping and Curing. The late arrival of general rains held up the development of the early planted section of the crop, so that the later plantings were ready to reap at the same time as the early ones. The result was that much good tobacco had to be left in the lands since the barns, labour and handling facilities were inadequate to cure the weight of ripe tobacco available. For three successive seasons many growers lost tobacco in this way and this must represent a large financial loss to both growers and the industry. This could be avoided by regulating the acreage planted to the facilities available. Added to the difficulties of reaping there were widespread attacks of white mould disease and many growers were compelled to reap leaf that was not fully ripe to prevent the disease destroying the leaf before it was taken. The impact of the disease was reduced, however, since lands that were badly infected could often be left, there being more than enough tobacco on lightly infected or disease free lands to keep the available facilities fully occupied.

A feature of the season was the wide use of portable tying machines which have proved very successful not only in speeding up reaping and tying, but also in reducing the amount of damage done to the leaf.

Many growers added to their barn accommodation. The new barns being built are mainly the internal furnace type and are better vented than the majority of the older barns. The high humidity of the atmosphere showed the limitations of inefficient outside furnaces and small vents. In these barns leaf took too long to dry out after colouring, and suffered in quality.

Pests and Diseases. Anthracnose disease in seedbeds was very widespread, with a higher incidence than in many previous years. There is no doubt that the fungicides Zineb and Thiram can control the disease and growers should treat the soil in the seedbeds as well as maintain a thorough spraying programme. Damage to crops in the land was traced, in all but one case, to the planting of seedlings with stem lesions.

White mould disease was especially severe at the higher altitudes and appears to be induced by cold overcast weather.

Probably the most serious disease economically is Rosette which had an almost 100 per cent. incidence in many areas in all tobacco planted after late November. The minimum precaution of spraying seedbeds against aphids was carried out only in a few instances. There was again a great deal of regrowth in old tobacco lands, especially in the outlying areas and this must be contributing to the high incidence of the disease.

Other pests and diseases were normal in their occurrence.

Grading. The volume and standard of tobacco graded on farms was higher this season than formerly, considering the lower quality of the crop.

Rotations. The use of grass leys as a rotation crop continues to increase but the early end to the rains prevented many farmers from sowing their pastures after the tobacco crop was ploughed in. The use of Munga as a rotation crop is declining. A disturbing trend is the higher percentage of second year land likely to be planted this coming season attributable, in the main, to the preference shown by the buying companies this season for leaf which carried spot. There is no doubt that the best tobacco is grown on first year land and that the quality of second year tobacco is, on average, inferior. On land where there is a dangerously high nitrogen status the risks of second year tobacco are very high.

Off Type Tobacco. There was a considerable quantity of tobacco produced this season that was off type, described as 'slick', 'slatey' and immature. Although obviously the larger quantity on offer was due, in part, to the vagaries of the season, some of this particular type of leaf appears annually and it is a matter that requires careful investigation.

Field Experiments. In co-operation with the staff of the Tobacco Research Board, several field trials were carried out in different parts of the country. These trials are making a very appreciable contribution to the general knowledge of tobacco production. Special appreciation is recorded to the farmers who undertook these trials and demonstrations.

Turkish. Planted during the period of almost continuous rain the Turkish crop made slow growth initially. The drought in March and April had the effect of reducing the yield still further though, at first, it had a beneficial effect on what promised to be a poor quality crop.

Burley. A number of trial plantings of Burley tobacco undertaken by farmers from seed supplied by the Department were grown in the maize areas mainly on heavy soils. Though late planted the tobacco grew out well in face of adverse weather conditions. Air curing of the crop was successfully done in converted fire-curing barns and open-sided sheds. Of the total crop of 32,160 lb., the majority was graded commercially by one firm and sold at one auction sale in Salisbury. The average price of 16.47 pence per lb. caused disappointment but there was sufficient confidence among several growers in the Shamva district to continue Burley production on a limited scale in the 1958 season. There seems little doubt that good quality Burley tobacco can be grown, especially on the heavy maize soils in the Shamva district.

General Remarks. In spite of a very difficult season many of our tobacco farmers showed that their growing techniques had advanced sufficiently to ameliorate largely the effects of bad climatic conditions. Such a season some ten years ago would have had a disastrous effect on the quality and total weight of tobacco produced, but as the standards of management continue to improve, seasonal effects will diminish. The contribution made to the general improvement in growing techniques by the Tobacco Extension Officers in the field, passing on the findings of research and disseminating the experience of the growers themselves, was a significant one.

Cotton. The acreage under cotton remains very limited and cannot be expected to improve until economic methods are found for the control of insect pests. Under irrigation in the lowveld it proved to be high yielding and profitable, and the insect control economically possible. It is confidently expected that this crop will find an important place in our lowveld irrigation schemes.

Castor Bean. The yields obtained from castor bean *(Ricinus* communis) crops were again disappointing, due mainly to the season and disease and insect pest damage. Until the major problems can be overcome there is very little hope of this crop becoming firmly established in the country. The indications are that a smaller acreage will be planted during the next season.

Fibre. Following the success obtained from trial plantings the previous year, a number of farmers produced good crops of kenaf *(Hibiscus cannabinus)* on a field scale. The crop grew well and yields were reasonable. Difficulties were experienced with harvesting and decorticating but, with the active interest of the jute factory, a local engineering firm is now producing a very satisfactory mobile decorticating machine. The harvesting problem is being actively pursued and it is hoped either to locate or manufacture suitable reaper and binder machines.

A pilot production scheme has been organised for the coming year and it is expected that some 2,000 acres will be grown by farmers in the various maize growing areas of the country. If this pilot project is successful and suitable harvesting machinery obtained, there will probably be a greater interest in this crop in the future.

Other fibre crops are being investigated by the Department of Research and Specialist Services as well besides the testing and improvement of different varieties of kenaf.

Grass and Vegetable Seeds. There was considerable interest in the production of certified grass and vegetable seed and a very active Growers' Association ensures high quality products. The price of some varieties of grass seed has been lowered this year, but the demand for good seed is increasing although sufficient seed of some species is now available to meet local demands.

Tea. The three major companies producing tea in the Chipinga and Inyanga areas are expanding their plantations as rapidly as possible. It will still be a considerable time before full production is achieved but there is no doubt that this industry is becoming well established and will be of great value to the country.

Coffee. Following on the visit by Mr. Melville, the Coffee Specialist from Kenya, and due to his valuable advice, renewed interest is being shown in this crop and progress has been made by two companies at Chipinga in establishing plants. It appears that conditions in certain parts of the Eastern Districts are very favourable for the production of coffee.

Sugar. Since the new company assumed control of Triangle Sugar Estates, there has been considerable expansion with a large new acreage cleared, planted and established under overhead irrigation. Expansion is also taking place at Chirundu where the owners have installed overhead irrigation to overcome water loss and increase yields with the better use of available water. The Hippo Valley Estates are also interested in sugar production and may develop in this direction. Several other concerns such as Nuanetsi Estates and a few individual farmers are planting cane on a small scale in the Victoria lowveld.

An interesting development is the planting of cane in the high rainfall areas of Chipinga by the Wattle Company. This body has successfully processed cane through their tannin extracting plant, and now intends growing a limited acreage on a trial basis, with a view to keeping the factory in operation throughout the year.

Softwoods. There has been an increase in the planting of softwoods in the Eastern Districts and large companies as well as private individuals have had a successful planting year. The winter rains were most valuable to ensure growth with the "pot" planting method. Close co-operation now exists between I.C.A. Committees and the Companies as well as with the Forestry Commission, to ensure adequate fire control.

Wattle. There was a steady increase in the production of tannin as larger acreages matured and became ready for felling. Wherever wattle plantations were established there was close co-operation between landowners, the I.C.A. Committees and officers of the Department in regard to stream bank cultivation, veld fires and road drainage.

(iii) *Fodder Crops.* Most livestock owners appreciate the need to provide supplementary feed for their animals during the dry period of the year, and in many cases adequate provision is usually made.

The past season was, however, rather difficult for the production of fodder crops and hay making. The most widely used crop for silage is still maize under-planted with a legume such as velvet beans. While legumes are most popular in the making of good hay (not often possible in the rainy season) fairly good results were obtained on many farms from planted pastures such as Rhodes Grass, etc.

There was a definite interest and increase in the planting of perennial fodder crops such as Dahl and Napier fodder. These crops, together with foggage grazing obtained from lands under grass in rotation with tobacco and maize, will play an ever increasing role in the feeding programme on farms. This is an economic method of maintaining stock in reasonable condition during the dry season.

The feeding of urea and molasses with roughage such as maize stover and/or cobmeal gained in popularity especially where these cheap low quality roughages were available in quantity.

Under irrigation in the lower rainfall areas, lucerne remained the most popular crop and responded well to good management. In the higher rainfall

regions grass-clover pastures did well and were used extensively on dairy farms. Annual cereal crops such as wheat, oats and barley were also grown as green feed for dairy cows. These crops are generally cut and fed in the manger and not used for grazing as in the case of the mixed pastures,

(c) **Livestock**

With the exception of parts of Matabeleland the past year can be described as a favourable one for livestock production.

(i) *Cattle.—Beef Cattle.* Following on a period of uncertainty, there has been an improvement in the development of definite breeding policies by most farmers and ranchers. It is considered that the beef cattle industry is settling down and there is greater interest in production on economic lines. The latest developments in the use of low quality roughage feeds with urea and molasses have been adopted by many farmers and are gaining ground.

There have been very few losses due to poverty except in a few areas, and general management of stock has improved. The main problem still to be overcome is the low calving rate on most properties. However, with more paddocking and the development of water supplies, it is possible to improve grazing management to the benefit of the cattle and with better nutrition the calving percentages will undoubtedly increase.

The control of internal parasites became more general and the information passed on to farmers by the Cold Storage Commission in respect of liver fluke damage created further interest in the control of these parasites.

The use of better bulls was most marked and there is a keen demand for good quality bulls, especially Africanders. The use of exotic breeds in the Midlands and Matabeleland is decreasing whereas there is an interest in the use of indigenous types in parts of Mashonaland and other areas where climatic and management conditions do not favour the exotic breeds. Quite a number of stud breeders were interested in a system of progeny testing and this new development is being watched with interest by most stockowners.

A few intensive high level short courses were organised for cattle farmers and these were very well attended and the response most encouraging. These courses will be continued in the future.

Dairy Cattle. There was a steady improvement in the management of dairy herds and farmers are showing much more interest in the breeding aspect. Similarly the buying of breeding stock was more selective and this must lead to an overall improvement.

In general, feeding was fair to good and most farmers endeavoured to cut the cost of feeds by producing as much as possible on their farms. Young stock were better cared for and this attention will reflect in the production in future years. The dairy bonus scheme has certainly been of great value and has had a direct effect on better management.

(ii) *Sheep.* There was in increased interest in sheep and breeders organized themselves and formed a Sheep Breeders Association. This is a very progressive step and increased production of mutton on an organized basis can be expected in the future.

Some excellent breeding stock is now available in the country and there is a good demand for locally bred rams of high standard. Several farmers now own flocks of up to 1,000 head.

General management improved and with the establishment of pastures in the high rainfall parts there was a greater demand for sheep to be developed as a side-line to crop production.

Blackhead Persians still predominate although the Dorper is becoming very popular. In some parts the German Merino is gaining ground where established pastures are available for grazing.

(iii) *Goats.* In isolated cases farmers reported success with goats, and in these cases the flocks increased in numbers as well as being improved by the use of imported Boer goat rams. It is believed that there is an important place for the goat in many parts of the Country.

(iv) *Pigs.* The general trend during the year was much the same as in previous years. The established producers improved their herds and with information becoming available from the Pig Testing Station there was an increased interest in breeding policy.

Some of the smaller producers have gone out of business but this is offset by a number of newcomers to pig production. The industry is certainly well established and with greater stability there is bound to be improvement in production. Losses from agalactia have not been as severe as last year and further research is being carried out in regard to this disease.

(v) *Poultry.* A definite improvement can be reported in regard to poultry production which is most encouraging. The deep litter system is very popular and has proved successful in all areas. Most producers have had a good year and with an ever increasing demand for poultry products the future should be reasonably good.

(vi) *Fish.* The general interest in fish production was maintained but not a great deal of actual progress was made on farms, mainly due to bad management of dams. One farmer is producing up to 600 lbs. of fish per acre from a small farm dam of three acres. With the co-operation of interested farmers and research officers, field trials have now been organized to demonstrate the correct systems of management under normal farming conditions.

(vii) *Livestock Improvement Scheme.* This Department continued to administer the Scheme and all field inspection services were undertaken by the Extension Officers and the Secretary of the Committee.

During the year five meetings of the Committee were held. Applications for grants on male and female stock numbering 259 were dealt with compared with 169 during the previous year. The number of animals involved were 346 bulls and 60 females.

In order not to delay the payment of grants unduly, the Committee agreed that the Secretary should approve grants when satisfactory reports were received and the applications were for ordinary types of grants such as for ranch bulls or dairy bulls for use in grade herds. The Committee continued to consider applications from pedigree breeders for grants on stud bulls and females, cases where increased grants were thought to be warranted and problems that arose in the Inspecting Officer's reports.

The quota granted by the Union Government for the importation of female stock from the Union of South Africa and its allocation to the three territories was as follows:—

	Quota	Southern Rhodesia		Northern Rhodesia		Nyasaland	
		1958	1957	1958	1957	1958	1957
Pedigree Dairy Females	300	140	260	120	120	40	20
Grade Dairy Females	1,350	710	725	600	725	40	50
Pedigree Beef Females	175	115	140	50	50	10	10
Grade Beef Females	75	—	65	65	75	10	10

During the year there was not the same demand to import female stock as during previous years.

A member of the Committee, the Chief Animal Husbandry Officer, Mr. J. C. Raath, attended the Rand Easter Show sale and purchased two high quality stud bulls for farmers. Another member of the Committee, Mr. A. L. Millar, O.B.E., attended the Bloemfontein September Show Sale where five Friesland bulls were purchased, three being for farmers in Southern Rhodesia and two for a farmer in Northern Rhodesia. The Committee also purchased a Friesland bull in the Union for the Artificial Insemination centre, and several bulls locally bred for farmers and the Henderson Research Station.

Importation of Cattle from the Union of South Africa. The number of male and female stock imported and the respective breeds are given below. The animals were imported either by the Committee or by farmers themselves.

	1.10.57 to 30.9.58	1.10.56 to 30.9.57	1.10.55 to 30.9.56
Pedigree Bulls			
Ayrshire	—	—	—
Friesland	30	39	21
Guernsey	3	—	1
Jersey	17	9	11
Aberdeen Angus	1	2	1
Africander	196	125	158
Hereford	20	8	2
Shorthorn	3	1	1
Sussex	26	47	21
South Devon	5	2	4
Red Poll	5	1	1
Brown Swiss	7	2	1
Brahman	4	—	1
TOTALS	317	236	223
Pedigree Females			
Ayrshire	—	4	33
Friesland	29 plus 1 calf	44 plus 1 calf	58
Jersey	36 plus 4 calves	16	54 plus 1 calf
Guernsey	16	—	10
Africander	48 plus 6 calves	77 plus 8 calves	187 plus 41 calves
Sussex	16	—	26
Brown Swiss	12	3	5
North Devon	—	17 plus 1 calf	—
Red Poll	—	5	—
Hereford	40 plus 7 calves	—	—
TOTALS	197 plus 18 calves	166 plus 10 calves	373 plus 42 calves
Grade Females			
Ayrshire	20	6	—
Friesland	314 plus 1 calf	219	364 plus 12 calves
Jersey	225 plus 15 calves	157 plus 9 calves	177
Guernsey	8 plus 2 calves	9	—
Red Poll	—	—	5
Africander	—	—	4
Shorthorn	—	9	—
South Devon	—	16	—
Sussex	—	10	—
TOTALS	567 plus 18 calves	426 plus 9 calves	550 plus 12 calves

	1.10.57 to 30.9.58	1.10.56 to 30.9.57	1.10.55 to 30.9.56
Pedigree Bulls			
Friesland	—	—	2
Africander	5	10	2
Aberdeen Angus	1	—	—
TOTALS	6	10	4
Grade Bulls			
Friesland	—	1	—
Africander	4	10	10
Shorthorn x Afr.	—	20	—
Brahman x Afr.	—	2	—
TOTALS	4	33	10
Pedigree Females			
Jersey	—	4	—
Sussex	—	10	—
Africander	10	25 plus 20 calves	15
Aberdeen Angus	10	—	—
TOTALS	20	39 plus 20 calves	15
Grade Females			
Friesland	—	10	10
Jersey	—	26 plus 9 calves	—
South Devon	—	10	—
Sussex	—	10	—
Africander	90 plus 85 calves	—	—
TOTALS	90 plus 85 calves	56 plus 9 calves	10

Imports from the United Kingdom for the year were as follows:—

	1.10.57 to 30.9.58		1.10.56 to 30.9.57		1.10.55 to 30.9.56	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
Ayrshires	—	—	—	12	5	22
Friesland	1	—	—	1	1	—
Jersey	3	9	2	2	1	—
Aberdeen Angus	1	—	—	—	—	—
Hereford	2	—	—	—	—	—
Shorthorn	—	2	—	5	—	—
Red Poll	—	—	—	—	1	2
North Devon	1	—	—	—	—	—
TOTALS	8	11	3	20	8	24

Imports from the United States of America were:—

	1.10.57 to 30.9.58		1.10.56 to 30.9.57		1.10.55 to 30.9.56	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
Brahmans	—	4	4	6	7	32
Santa Gertrudis	4	—	4	12 plus 1 calf	—	—
Hereford	1	—	—	—	—	—
TOTALS	5	4	8	18 plus 1 calf	7	32

The Santa Gertrudis and Brahman cattle recently imported seem to have settled down and are doing well.

Sheep Purchased and Imported from the Union of South Africa:—

	1.10.57 to 30.9.58	1.10.56 to 30.9.57	1.10.55 to 30.9.56
German Merino Rams	2	—	—
Dorper Rams	9	22	3
German Merino Ewes	20	—	—
Dorper	13	39	—
TOTALS	44	61	3

Breed Societies. During the year inspection tours of Southern Rhodesia were made by Inspectors of the Africander Cattle Breeders' Society, the Jersey Cattle Breeders' Society and the Friesland Cattle Breeders' Society. It is understood that, after judging the Red Poll Section at the Salisbury Agricultural Show, the President of the Society visited breeders throughout the country. In addition to the visits of the Breed inspectors, the President and Secretary of the Friesland Cattle Breeders' Association made a goodwill tour of the country, during which time they not only visited several breeders and attended farmers' days or gatherings, but also held a short course of three days' duration. There was a good attendance at this course and several of the Department's more senior Officers attended. Inspections were done by the Animal Husbandry Officer of the Department for the Aberdeen Angus, Jersey, Friesland, Red Poll and Shorthorn Breed Societies. The inspections for the Jersey and Friesland Societies were done only in special cases.

6. PRODUCTION FROM IRRIGATION

(a) General Progress of Irrigation

The development of irrigation during the year has been steady but the present expansion is not as rapid as it was a few years ago when supplementary irrigation of tobacco was becoming very profitable and very popular. In recent years water planting of tobacco has proved almost as satisfactory with the result that further expansion of irrigation schemes purely for tobacco growing has declined. At present there is no major crop which can take the place of irrigated tobacco with the result that irrigation development is slower but steady, and covers a wide range of crops of which the main ones are vegetables (particularly peas in the Eastern Districts) and fodder crops throughout the country. It is estimated that about 2,000 acres of new irrigation schemes are developed annually by the farmers and in addition company development of sugar, tea and citrus is expanding rapidly. During the year the Water Court dealt with almost 1,000 applications for water rights, most of which were for irrigation purposes. No complete figures are available of the total water rights issued. It is estimated that about 30,000

acres of winter and permanent crops, and about 12,000 acres of summer crops were irrigated during the year. This figure is still far short of the actual potential of about 60,000 acres of winter irrigation and perhaps 30,000 or more acres of summer supplementary irrigation.

(b) Irrigation Officers

There is no doubt that the Department's Irrigation Officers are doing a great deal to bring about sound irrigation development in all parts of the country. Unfortunately most of our farmers do not yet appreciate the powerful contribution irrigation can make towards stability in, and intensification of farming in all parts of Southern Rhodesia. It was unfortunate that the services of the Irrigation Officer serving the Midlands and Matabeleland regions were lost but everything possible is being done to find a suitable replacement.

(c) Training Courses

A considerable number of short courses and lectures on irrigation were held for the Department's staff throughout the Federation. Two intensive courses were held at Henderson Research Station and thirteen short courses were held at Group level in Matabeleland, Midlands and Northern Rhodesia. The Group lectures were usually of three days duration and constituted preliminary courses in irrigation. The intensive courses continued for fourteen days and covered all aspects of irrigation farming.

(d) Major Schemes

(i) *Umshandige.* Progress of this scheme is slow but is gaining momentum. The Irrigation Officer has been of great assistance and has been invaluable in organizing demonstrations, etc. The yield of crops and the use of water on the lands are improving. Overhead irrigation is becoming popular and should prove of great benefit to farmers.

The I.C.A. Committee owned land plane has been modified and the method of use has been demonstrated to the farmers. The reactions of most farmers have been encouraging and much progress should be made in land levelling in the future. The problems of irrigation on this scheme are largely due to uneven lands and if this matter is attended to far more efficient irrigation should result and good crop yields obtained.

(ii) *Umgusa.* Overhead irrigation is mainly used on this scheme with good results. The fine sandy nature of the soil made flood irrigation very difficult and inefficient, and the use of overhead spray irrigation is a sound development. At times the water application has not been too good but several demonstrations, talks and slide shows have helped the farmers to improve their techniques.

(iii) *Coloured Settlers' Scheme:—Mazoe.* Two settlers have made good progress and are well established but the remaining three have not kept up their standard of farming. The Committee has again resumed closer control over the affairs of these more backward settlers.

Vegetables continue to be the mainstay of the scheme and the standard of production and management is still reasonable.

Good yields of maize have been obtained; on one land a settler averaged 30 bags per acre while the two good settlers averaged nearly 20 bags per acre for the whole crop.

(iv) *Triangle Sugar Estate.* Steady progress was maintained at Triangle. The main interest at the moment is the establishment of the 4,000 acres overhead irrigation scheme. Very little further development can take place below the existing canal, expansion being possible only above it. The first 1,000 acres have been planted and the cane is growing well. The development of this area has been very rapid and it is largely due to the use of overhead sprays that it was planted so soon. The land is undulating and a flood scheme would have been less convenient and would almost certainly have taken a longer time to put into effect.

It will be very interesting to see how effective overhead spray irrigation will prove with sugar cane. The dense mass of leaves of mature cane may prevent a great deal of the applied water reaching the soil. Yields of cane on some of the settlers' lands have been about 60 tons per acre and these have been flood irrigated. The average in the past on the Triangle Estate has been about 30 tons per acre.

(v) *Hippo Valley Citrus Co.* The citrus is growing very well and the irrigation cycles of the trees have been improved upon which has largely resulted in the good growth. The sandy nature of the soil prevents good flood irrigation and the trees will soon be too big for the present water carts to be able to supply

sufficient water. However, the staff are now experimenting with thin plastic lining used as sleeves and this should overcome many of the difficulties.

The small committee dealing with experiments and trials had one meeting at the Estate and decided on a programme of work which should prove of great value.

(vi) *Chirundu Sugar Estates.* Due to severe loss of water and ineffective flood irrigation, the company has now changed over to spray irrigation. The project is as yet not in full operation and many problems still need investigation. Additional land has been cleared and prepared for planting during the coming season.

(vii) *Sabi Development Farm.* Mr. J. Cohen, the lessee, terminated his lease during the year and a new applicant Mr. E. M. Hein, took over the farm during September, 1958.

Good progress has been made on the farm and much valuable information obtained as to the most suitable layouts and methods of soil, crop and water management, as well as on the economics of the enterprise. Considerable progress and development are expected over the next few years.

7. SOIL CONSERVATION

(a) Arable Areas

(i) *General.* The practice of good conservation continues to expand throughout the farming community as evidenced by the increased protective measures taken, both mechanical and biological, and in the resulting upward trend of the national average production of the country's main arable crops. Considerable improvement will still be made in consequence of the help and guidance given by our advisory staff and by farm planning and the resultant sound land use. There is an ever increasing awareness on the land that good conservation pays good dividends.

Ridge and furrow layouts and subsurface drainage for the control of excess water in wet areas have shown their value and are being more widely adopted.

(ii) *Mechcanical Protection on Arable Land.* The following table shows that progress was as great as ever: —

Region	Period	Contour Ridges & Storm Drains (Miles)	Bench Terraces (Miles)	Irrigation Furrows (Miles)	Pasture Furrows & Veld Ripping (Miles)
Mashonaland	1955/56	3,312	1	52	1
	1956/57	3,327	2	21	—
	1957/58	3,137	1	41	7
Midlands	1955/56	7,737	5	33	412
	1956/57	703	13	36	24
	1957/58	760	2	22	5
Matabeleland	1955/56	104	12	11	14
	1956/57	158	1	11	—
	1957/58	395	9	21	—
Eastern	1955/56	1,555	12	39	2
	1956/57	1,558	10	56	2
	1957/58	1,818	9	54	—
TOTALS	1955/56	5,708	30	135	427
	1956/57	5,746	26	124	26
	1957/58	6,110	21	138	12

The above figures are impressive, but better land selection and use and better crop management will do much to increase production and conserve the soil.

(b) African Cultivation

Excellent progress has been made in the various fields of African cultivation. A number of Mission Stations in the Eastern Districts and Matabeleland co-operated with the I.C.A. Committees and the Department in an endeavour to improve the cultivation and conservation practices on their land. Land-use plans have been developed in some cases and, with the assistance of agricultural officers and demonstrators appointed by the Mission bodies, are now being implemented. It is fully anticipated that this example will be followed by Mission Stations in other parts of the country where the position is still highly unsatisfactory.

Progress has also been made with the orderly settlement of squatter labour on the ranches of the major land-owning companies. It will, however, still take considerable time to complete the planning and settlement on all the properties. Similarly there is slow but steady improvement with the demarcation of land for settlement of labour on individual farms and ranches. In some I.C.A.s Committees have been very active and have the matter under complete control.

(c) **Roads and Railways**

Erosion from roads and drains is still a problem but a diminishing one as better liaison is established between the various bodies concerned I.C.A. Committees, Road Councils, this Department and farmers. Preventive and protective measures are being more widely applied and badly located farm and Road Council roads are gradually being realigned. In many instances advice is asked for before construction begins and often before new roads are aligned.

Correctly located, public, minor and farm roads are a good investment in that they are open to traffic in almost all weathers and very often susbstantially reduce maintenance costs.

On main roads the position is better than ever and continues to improve. It does seem, however, that there is need for a wider road reserve in order to be able to construct wide, shallow-running and non-eroding grassed drains. The narrow, deep drains sometimes constructed because of insufficient width of road reserve are on occasions an erosion hazard.

(d) **Research**

(i) *Erosion Control—General.* No major changes or additions were made to the programme of field run-off experiments. Chemical analysis of eroded material was undertaken for the first time, determinations being made both at Henderson Research Station and at the Salisbury Laboratories of Chemistry Branch. New projects operated co-operatively with the other Departments were started on rainfall studies, and on the consumptive use of water by maize and other crops.

The 1957/58 rainy season was remarkable for its complete lack of erosive rains, and the erosion results are not included in this report, since they merely confirm those of the previous year.

Report on Present Programme.

Series I. There were no new additions, except that miniature run-off plots were added to Experiment 1 for correlation purposes. The possibility of transferring Experiment 2 (contour spacing) to the sandveld was considered and it was agreed that this experiment should be transferred to the sandveld on Series III after the 1958/59 rainy season.

Series II. No additions or changes were made except that plot II is now ready for recording. The Joint Evapotranspiration project was established adjacent to Series II.

Series III and IV. No changes were made except that all plots previously under tobacco treatments are now being used to compare various tobacco/grass ley rotations. Miniature run-off plots are now being established so that losses of soil and plant nutrients can be followed during cropping sequences starting from virgin conditions.

Field Scale Experiments. Field scale experiment on various methods of continuous trash farming of maize continues. Virtually no run-off has occurred from these lands for the last two years, and crops are improving.

Additional Projects.

1. *Miniature Plots.* Run-off plots six feet by three feet are being installed in Series I and III. A number are on the border areas of established plots to determine the correlation between them and the normal size plots. Others are being established on virgin ground on the sandveld so that losses may be measured under virgin or first year conditions, which are no longer available on the main plots. These plots will be in full operation during the coming rainy season.

2. Two experiments are being undertaken jointly with the Federal Department of Meteorological Services.

(a) A study of rainfall and run-off over the past few years with the object of correlating run-off with the amount and rate of rainfall. This is being done by comparing the rate, amount and time of rainfall, bearing in mind the time of year and previous rain, with the amount

and time of run-off as revealed by records obtained from the plots.

(b) A study of drop sizes and distribution of high intensity rainfall. Rain is caught in pans of flour, baked, and the pellets so formed sieved out, the intensity of the rain during this collection is accurately measured. By reference to pellets artificially produced from drops of water of known size, the spectrum of any rainstorm can then be determined.

3. The "Joint Evapotranspiration Project" is operated in conjunction with the Federal Department of Research and Specialist Services, the Federal Department of Meteorological Services and the University College of Rhodesia and Nyasaland. The object is to study the plant/water relationships of maize, veld and pasture, and the method is for specialists in meteorology, plant physiology, etc., to each study his own field, but with a full inter-change of ideas and results, there being simultaneous experiments on a common site. The particular responsibility of this Department is the fencing, land preparation and growing of the crops, the construction and operation of lysimeters and piezometers, and the determination of soil moisture.

During the 1957/58 rainy season the site development was completed, the crops established and the instrumentation completed. Experimental work consisted chiefly of developing and testing the various techniques, and obtaining preliminary results, which will enable quantitative results to be obtained next year.

(ii) *Water Table Control.* The need to put the wet areas of the country to full productive use is becoming more urgent and research on this subject is to be commenced during the coming year.

(iii) *General.* There is great need for research into soil tillage and treatment, the correct use of implements and the use of correct implements. Considerable research is being carried out on crop production under various conditions and management practices but none on the effect of tillage practices which will affect both productivity and the condition of the soil.

Allied with this is a requirement for facilities for modification, redesign and design of equipment as found necessary in the above work.

There is a need for an implement and equipment testing station which need not be started as a full-scale testing establishment but rather as a small unit with only basic equipment at the commencement, gradually increasing in scope as the need arises. A Machinery Committee of the Rhodesia National Farmers' Union, with representatives from the R.N.F.U., the Trade, the Department of Research and Specialist Services and the Department was formed to devise ways and means of setting up an implement testing station—probably at Gwebi College—but has made little progress as it has not been able to evolve a satisfactory and acceptable method of financing the setting up and operation thereof.

(e) **Grazing Areas**

(i) *General Management.* The importance of good veld management is generally appreciated but very few landowners were able to apply a definite system due to lack of paddocking, watering points and other facilities. In the higher rainfall areas farms are generally understocked although overgrazing does occur in isolated cases. In the lower rainfall areas farms are well stocked and, with a series of good seasons the grazing has been well maintained.

(ii) *Veld Fires.* It is pleasing to report that there has been a definite improvement in the control of veld fires. This is due in the main to closer co-operation between farmers in the construction of fire-guards, the assistance of the police and the propaganda put out by the I.C.A. Committees and the Natural Resources Board. Where burning was necessary it has been well controlled by the landowners either on an individual or co-operative basis.

(iii) *Bush Encroachment.* This is still one of the major land-use problems in many parts of the country and, without an economic and entirely practical solution yet in sight, a feeling of frustration among landowners is created. The problem of bush control received close consideration at the Livingstone Conference on weed control and an effort is being made to intensify research on this problem throughout southern Africa.

A number of field trials have been carried out in co-operation with commercial concerns, embracing the use of chemicals, and although some results are promising no definite recommendations can as yet be made to farmers.

(iv) *Fencing.* Good progress can be reported in the fencing programme on many farms and ranches. With an increased interest in livestock in the cropping

areas there is a definite increase in the erection of boundary and internal fencing. Costs are still high but fencing is absolutely essential for the full development and use of any holding. The farm planning programme is of great assistance to landowners ensuring the correct position of paddock fencing.

8. WATER CONSERVATION

(a) Dams Built under the Guidance of the Department

While there has been a small increase in the total number of dams built, the total storage capacity has dropped. The tendency this past year has been to build smaller dams in the regions of higher rainfall, and larger dams in the lower rainfall regions. The series of good rains experienced in past seasons, coupled with the fact that the country is passing through a financially stringent period are the main contributing factors for the decrease in the total storage capacity provided during the year under review. Much, however, remains to be done in the field of water conservation and farmers should be encouraged on every possible occasion to conserve water when they can make good use of it.

TABLE A

Region	Period	No. of Dams	Aggregate Capacity Gallons	Average Capacity per Dam Gallons
Mashonaland	1955/56	80	621,300,000	7,766,000
	1956/57	72	399,020,000	5,542,000
	1957/58	105	473,928,000	4,513,000
Midlands	1955/56	95	464,705,000	4,892,000
	1956/57	77	781,850,000	10,284,000
	1957/58	84	253,360,000	3,016,000
Matabeleland	1955/56	153	527,300,000	3,450,000
	1956/57	142	679,200,000	4,783,000
	1957/58	133	882,000,000	6,631,000
Eastern	1955/56	25	34,700,000	1,388,000
	1956/57	20	100,565,000	5,028,000
	1957/58	39	23,600,000	605,000
Totals	1955/56	353	1,648,005,000	4,680,000
	1956/57	311	1,960,635,000	6,304,000
	1957/58	361	1,632,888,000	4,520,000

An encouraging feature is the large increase in the number of dams built by farmers (see Table B below), in contrast to the decrease in numbers built by both I.C.A. and Government operated machines.

TABLE B

Year	Farmers		I.C.A. Committee Units		Government Units		Total No.
	No.	%	No.	%	No.	%	No.
1955/56	130	36·9	84	23·8	139	39·3	353
1956/57	146	46·9	50	16·1	115	37·0	311
1957/58	253	70·1	42	11·6	66	18·3	361

(b) Mechanical Units

I.C.A. Units. Four I.C.A. Committees owned and operated their own tractor units while one has closed down its operations in this field. These four have had a full programme of work and have operated their machines economically and efficiently.

Government Units (Southern Rhodesia). There has been a slackening of demand for work by Government units, the main reasons apparently being continued high rainfall, peculiarity of last summer's weather and its effects on crops, and the restrictions of credit.

A programme of replacement of existing tractors by new and more powerful ones is being put into effect and these tractors have been favourably received by the farming community.

The large bush clearing programme at Triangle Sugar Estates was successfully concluded.

(c) **Catchment Schemes**

(i) *Bembesi-Inhwekwesi.* No special measures were taken in regard to works in this catchment. The trials planned for the control of erosion on some of the problem soil types have been instituted and results will be awaited.

(ii) *Umzingwane.* A large percentage of the protection works planned for this catchment have been completed with the funds available. Further works will be undertaken during the coming year. The dam for the Municipality on the Umzingwane river is now nearing completion and the protection of the catchment is therefore important.

(iii) *Kyle.* Most of the works in the Kyle catchment have been completed and in future it will only be necessary to improve the overall management of the land through good land-use principles.

(iv) *Umwindsi.* The report of the Committee on this catchment has been considered by the Natural Resources Board and recommendations made for consideration by Government.

(v) *Marimba.* A Committee was appointed to investigate and report on the catchment of the Marimba river. Most of the work has been done and the report should be available shortly.

(vi) *Tanganda.* Further investigations are being undertaken in this catchment by the Melsetter and Chipinga I.C.A. Committees and the reports are still awaited.

(vii) *Odzani.* This catchment is also being considered by the Umtali North I.C.A. Committee and it might be necessary to institute protection works and improved land-use practices to safeguard the water supplies of Umtali.

(viii) *Sabi.* Work is proceeding in the Sabi catchment in accordance with the measures recommended by the Planning Team. It will naturally be some time before some of the major works will be undertaken but the implementation of the planning recommendations should bring about considerable improvement.

9. FIELD TRIALS

Numerous field trials were again organised and carried out in co-operation with farmers and the Research Officers. These trials were useful in that the information obtained was of value to the farmers in the particular area as well as to the Research and Extension Officers.

In the Eastern Districts the Group I.C.A. Committee requested the appointment of a special officer to assist the local staff with further trials. The Committee being convinced of the value and need for this work feels that it should receive much greater emphasis and support. This is certainly encouraging.

All trials are most carefully planned and examined by a Committee of senior officers before final implementation. Every endeavour is being made to ensure that the trials are well managed by the co-operating farmers.

The following table reflects the field trials for the year:—

FIELD TRIALS: 1957/58

Field Trials	Matabele-land	Mashona-land	Eastern	Midlands	Total
1. Stubble Mulch	—	1	1	3	5
2. Fertiliser Trials on General Crops	8	6	12	7	33
3. Fertiliser Trials on Fruit Trees	—	—	1	—	1
4. Trace Element	6	2	2	2	12
5. Castor Bean	6	7	—	6	19
6. Maize Variety	—	3	2	3	8
7. Cotton Variety	1	1	—	3	5
8. Soya Bean Variety	—	1	—	1	2
9. Summer Wheat Variety	—	5	1	—	6
10. Tobacco Variety	—	23	—	—	23
11. Kenaf Variety	—	3	—	—	3
12. Potato Variety	—	1	—	—	1
13. Sugar Cane Variety	—	4	—	—	4
14. Lucerne Variety	—	2	—	—	2
15. Kale	—	1	—	—	1
16. Mopani Soil Experiments	—	—	—	1	1
17. Pasture	2	—	1	2	5
18. Bush Control	—	—	—	4	4
19. Gully Control	—	1	—	4	5
20. Drainage Demonstration	—	—	—	3	3
21. Urea Feeding	1	—	—	—	1
22. Maize Demonstration Dryland	—	3	—	—	3
23. Maize Demonstration Irrigated	—	5	—	—	5
TOTAL	24	69	20	39	152

10. ADVISORY SERVICES

(a) General

The Department continued to render free advisory services to the farming community. The great demand for assistance indicates that these services are greatly appreciated and valued.

The officers of the Department maintained a satisfactory standard of assistance despite mileage restrictions. The programmes of work of the field staff had to be carefully planned and the co-operation of Committees and farmers in this connection is much appreciated.

The following table reflects the number of visits made by officers in connection with their numerous duties:—

VISITS MADE BY OFFICERS OF THE DEPARTMENT

	Eastern	Midlands	Matabele-land	Mashona-land	Total
Pegging					
1. Contours	807	471	150	1,764	3,192
2. Storm Drains	32	55	23	56	166
3. Grass Strips	9	13	5	67	94
4. Other (Pasture Furrows)	16	65	10	250	341
5. Roads and Road Drains	43	106	29	222	400
6. Irrigation Works	91	89	68	111	359
7. Dams	134	253	301	645	1,333
TOTAL	1,132	1,052	586	3,115	5,885
Inspections					
1. Subsidy	21	57	112	122	312
2. Water Court	122	63	65	212	462
3. Roads	127	108	14	170	419
4. Timber Cutting	3	11	29	3	46
5. Land Settlement and Crown Land	20	96	44	74	234
6. Sub-division of Land	34	38	35	106	213
7. Seed	14	23	2	37	76
8. Livestock Improvement	32	96	112	107	347
9. Livestock, Other	98	67	39	44	248
10. Mechanical Units	31	211	404	963	1,609
11. Miscellaneous	142	375	212	545	1,274
TOTAL	641	1,145	1,068	2,383	5,237
Advisory					
1. Field Crops	1,389	932	308	1,256	3,885
2. Veld and Pasture	35	139	86	116	376
3. Livestock	40	263	340	161	804
4. Irrigation	57	153	153	161	524
5. Conservation	329	692	343	911	2,275
6. Farm Planning	1,156	1,697	353	2,112	5,318
TOTAL	3,006	3,876	1,583	4,717	13,182
Meetings					
1. I.C.A. and Group	203	346	285	576	1,410
2. Farmers' Association and Road Council	76	106	49	161	392
3. Staff	125	112	112	262	611
4. Miscellaneous	116	143	101	264	624
TOTAL	520	707	547	1,263	3,037
Other Visits					
1. Research Stations	91	61	73	230	455
2. Farmers Days	125	113	67	161	466
3. With Committees	245	100	28	193	566
4. With Specialists	273	229	233	413	1,148
5. Miscellaneous	533	458	462	1,257	2,710
6. Field Trials	235	461	274	357	1,327
TOTAL	1,502	1,422	1,137	2,611	6,672
GRAND TOTAL	6,801	8,202	4,921	14,089	34,013

(b) Land-Use Planning

General. The past year has been the first one in which the Department has had a full and adequately staffed Planning Section. This development has had widespread beneficial repercussions on the work of the Department.

Farm Planning. The output of plans was lower than had been estimated and only 218 were brought to finality during the year. Very high standards have been set and these plans were all sound, and are proving to be of great value to their

possessors. The fact that the demand for assistance still far outstrips the present production rate speaks well of the quality of the work.

At present a further 464 plans are in various stages of active planning. This very high number in relation to those actually finalized, results from maximum use being made of the dry season for the field work required on these plans, most of which will be finalized before the end of the rains. There is no doubt that the experience gained by our staff over the past two years will, under the co-ordinated guidance of the Planning Section, result in a very considerable stepping-up in the output of plans.

Lack of adequate aerial photography held back planning in certain areas of Matabeleland. Considerable improvement was, however, effected in this direction during the year and the Department (in some areas in collaboration with I.C.A. Committees and with the generous assistance of the Bulawayo City Council and the Wankie Colliery Co. Ltd.) was through the Department of Federal Surveys, able to cover a greater area than originally anticipated with up-to-date photography.

Initial Development Planning. Assistance with the opening up of new areas on a planned basis has proved of great benefit. Initial development plans were produced for the following areas:—

Region	*I.C.A.*	*Acreage*	*No. of Farms*
Mashonaland	Darwin	235,548	76
	Horseshoe	17,792	10
	Banket	28,000	12
	Beatrice	30,000	10
	South Ayrshire	20,000	4
	Eldorado	30,000	13
Midlands	Enkeldoorn	120,000	Large Ranch
		481,340	

Sabi Catchment Planning.—(i) *Planning.* The Sabi Catchment Planning Team which commenced planning in the southern half of the Wenimbi I.C.A. completed the area in July, 1958. Work was then started in the Marandellas West I.C.A., but due to a delay with photography which deteriorated, planning had to be extended into the Marandellas South and Wedza I.C.A.s. In these areas only those farms falling within the catchment of the "Wye Valley Dam" were worked on.

The steady progress which has been maintained is reflected in the following:—

FARMS PLANNED

At 1.10.57	2	
At 1.4.58	23	
At 1.8.58	42	
At 1.10.58	55	153,000 ac.

Although progress has been satisfactory it is hoped to increase considerably this output of high quality work in the catchment during the coming year.

(ii) *Water Conservation.* The siting of dams and weirs continued. In the Wenimbi I.C.A. 224 dams and 58 weirs were sited of which 65 dams and all the weirs fall under Irrigation Department responsibility.

In the other areas worked in by the team, sitings have been as follows:—

	Dams	*Weirs*
Marandellas West	23	5
Marandellas South	20	4
Wedza	9	—
	52	9
Add Wenimbi	224	58
	276	67

A map has been prepared which shows all these sitings and therby indicates the distribution of these potential works. The avarage number of sitings per farm approaches five dams and one weir, and since his arrival in February, the Conservation Officer for water-conservation and mechanical units has cleared up all the assessments of dams for which this Department is responsible.

In addition to planning by the team, all local officers have done planning in their own Areas over the past field season. In these Areas, thirteen plans have been finalized and 82 further plans are nearing completion.

Miscellaneous Planning. The Department has satisfied a large and continuous demand for planning services, embracing a wide field of subjects, from many

Departments of both the Federal and Southern Rhodesia Governments. The latter Government relies heavily on ours for guidance in all matters impinging on European Agriculture and this type of assistance has been given especially to the Southern Rhodesian Departments of Lands, Town and Country Planning and Native Agriculture. Very close liason has been maintained between this Department and the Territorial Departments dealing with non-European agriculture, and the Planning Section has on numerous occasions rendered assistance in an advisory capacity on land-use problems in African areas.

(c) **Farmers' Days**

A total of 178 well organized field days were held in the various I.C.A.s during the year. In most cases the Committees organized the programmes in consultation with the local Conservation and Extension Officers and invited guest speakers where necessary. The discussions were generally of a high level. Experienced farmers also expressed their views or explained techniques and methods which resulted in a great deal of good practical information being disseminated.

In some areas small discussion groups were organized in respect of single enterprises such as tobacco, maize, etc. Committees arranged for groups of farmers to meet regularly at fortnightly or three weekly intervals on farms in their Areas for the purpose of discussing various aspects of crop or animal production. This has been most effective and farmers are very keen and enthusiastic. It is felt that such an approach could be adopted over a much wider field of agriculture.

(d) **Shows**

Agricultural shows were again held at all centres and, with two exceptions, there was a vast improvement generally. Livestock entries, as well as produce, were well represented and the preparation of exhibits was a credit to the owners.

Officers of the Department assisted as stewards and judges at all shows and at the smaller centres took a leading part in the organization of various sections. A departmental exhibit was staged at all centres with the main emphasis on farm planning.

(e) **Conservation Courses for Teachers**

A new system was tried out during the past year in regard to conservation courses for teachers which proved to be rather disappointing. Instead of the usual five day courses during vacations it was decided to arrange for teachers to meet on five to seven successive Saturday mornings for lectures and visits to farms. The lectures were not always attended and the tours, although popular, were sometimes missed due to other engagements. After very careful examination by the Conservation Education Sub-Committee of the Natural Resources Board it was decided to concentrate during the coming year on one day visits into the country and it is expected that these will prove very popular with teachers.

Arrangements were also made with the University authorities for trainee students to be taken on visits to farms and other worth while places to encourage and stimulate interest in our cause. This programme was reasonably successful but will require further organization in the future.

(f) **In-Service Training**

General. Although adequately equipped and staffed on the planning side, the Department's new Planning and Training Branch has had inadequate facilities to do the bare minimum essential training without strain. No training equivalent to the Senior Planning Officer is as yet available nor does the simplest of lecturing accommodation exist, and the programmes have been carried out under difficulty. In spite of this a great deal has been accomplished.

Training. All new officers entering the Department during the year were given a short course of photo-interpretation on arrival and prior to their being sent out for field instruction under Group Officers. This training has enabled them to get the maximum benefit from field exercises.

In-service Training. The main emphasis of in-service training given over the past year was to ensure that all field staff—particularly at Group level—were brought completely up to date with all planning techniques and au fait with the latest approaches and developments in agriculture.

In spite of lack of facilities a considerable programme of training was successfully accomplished. On a series of six Farm Planning courses 105 officers were given training while on six Irrigation and two Beef Husbandry courses 64 and 55 officers, respectively were trained.

These courses were again of a very high level and standard and as in the past were made available to officers from other Governments, even those outside the Federation.

In addition to 49 members of the Agricultural Departments of Northern and Southern Rhodesia who attended courses, two Portuguese extension officers from Angola were accommodated on Farm Planning Courses as was a Tobacco officer from Nyasaland. Two officers from the Revue Scheme in Mocambique were given training in Irrigation, also an officer from the Kafue Polder Scheme in Northern Rhodesia. Three planning officers from the Revue Scheme were given instruction in land-use planning under the Sabi Planning Team, and two Portuguese tobacco advisers from Malema were accommodated on informal non-course training.

Farmer Training, at advanced levels, has again been undertaken on a small exploratory basis during the year. So successful has this been that it is proposed to expand it considerably. High level courses embracing the entire field of beef production and including the latest research findings were given, and it is now certain that this form of instruction offers one of the most potent untapped extension methods. Programmes are already in hand to project this form of training further in respect of other branches of farming and irrigation.

(g) **Young Farmers' Clubs**

Every effort was made during the year to streamline the national policy of the movement and credit is due to the Council for this positive direction. With the limited staff available it became essential to organize the movement in a manner whereby the Organizers can be of the greatest assistance throughout the country.

Base-line programmes were worked out for clubs and meetings held at the regions with the leaders in order to finalize programmes and discuss policy for the future.

This system has undoubtedly helped to offset the shortage of Organizers and the achievements at all levels were most encouraging.

The Organizer for Matabeleland was on long leave which meant that the Senior Organizer had to shoulder a heavy load, and could not attend to individual clubs often enough with the result that there was some stagnation. The need for additional Organizers remains in spite of the re-organization and improvement as described above.

It was possible during the year to continue with the International Exchange system and two members from Southern Rhodesia went to the United Kingdom while two members from there made a visit to this country. These visits are invaluable but with shortage of funds it might not be possible to continue. The feeling has also been expressed that it might be advantageous for leaders to visit other countries rather than members all the time.

Another successful national training camp was held for leaders and members at the Henderson Research Station. The attendance of leaders was rather disappointing, but the members were keen and the camp was of considerable value to all those who were present. It was also possible to organize a short course on poultry with the co-operation of the Gwebi College of Agriculture. District tours were again arranged and proved very popular and valuable, and with experience gained further progress is expected in this regard.

We are deeply grateful for the valuable assistance received by the movement from individuals, organizations, commercial concerns and other bodies, as it would be impossible for this organization to continue without such generous help.

(h) **Agricultural Engineering**

Farm Machinery Advisory Service. Although there is only one officer on this service he has contributed materially to raising the standards of land cultivation and of machinery use and maintenance. Non-selective purchase of equipment and poor standards of use and maintenance have cost the farming community considerable sums of money and they are now slowly becoming aware of this. The demands for this engineer's assistance have now grown to far beyond his capacity to satisfy them and there is a need, becoming more urgent daily, to expand this service to meet the needs of our widespread farming community.

Farm Buildings Advisory Service. It is gratifying that farmers are now making considerable use of this valuable service but an analysis of the requests, although indicating that the problems range over the whole field of farm structures, shows that such important aspects as good materials, good standards of con-

struction and maintenance, and well-planned buildings and layouts are not being given sufficient attention by the farming community. This will no doubt change, but it is obvious that the service needs to be expanded in order to cope with the quantity of work and to enable the more important aspects of building to be adequately stressed.

(i) Tobacco Advisory Work

The work carried out by the officers trained to advise on tobacco is outlined in the analysis of visits, below:—

	1957/58	1956/57
Farm Visits	5,203	4,125
Visits to Tobacco Research Board Stations	312	191
Grading Shed Visits	175	174
Miscellaneous	447	383
Total Visits during the Year	7,854	5,063

Of the 5,203 farm visits 2,246 (47 per cent.) were in answer to specific requests from the farmers concerned.

There was an increase in the amount of assistance given to farmers, not only through the increase in the number of officers in the field but also through an increase in the number of visits made by the more experienced staff. Many of these men are now fully conversant with all the problems of the area in which they have worked for up to five and more seasons and can give sound advice on local as well as the more general facets of production. All the officers in the field pay a monthly visit to one or two experienced growers in their areas for the purpose of discussing with them problems of a local nature. The Department is extremely grateful to these growers, some of them Councillors of the Rhodesia Tobacco Association, for their assistance.

The Chief Tobacco Extension Officer and Tobacco Extension Officers kept in close touch with officials of the Rhodesia Tobacco Association and the Tobacco Research Board of Rhodesia and Nyasaland.

In the course of the year, 175 visits were made to Tobacco Grading Warehouses and reports submitted to the Tobacco Marketing Board. During a period when the auction sales were in progress officers were in attendance inspecting the standard of commercial grading. Whenever cases of unsatisfactory grading were seen the officer in whose area the warehouse lay followed up the report with an inspection.

11. EXPERIMENTAL FARMS

The two Experimental Farms at Karoi and Chipinga continued to fulfil a valuable function in the areas served by them. Unfortunately general development had to be curtailed due to shortage of funds but overall progress was good. Not only was it possible to demonstrate successfully on them up to date methods of soil, crop and animal husbandry but a considerable amount of applied experimental work of great value to the areas was carried out in collaboration with the Department of Research and Specialist Services. An important aspect of this work dealt with farming systems suitable for the two areas. The Farms were also of considerable educational value to our advisory staff responsible for their operation.

Work programmes were planned in consultation with the local I.C.A. Committees who take a great deal of interest in the Farms. This in itself ensures co-operation and confidence in the work. Field Days were also held on each, and numerous visits made by individual farmers for the purpose of giving information.

12. S.A.R.C.C.U.S.

The Director and Deputy Director attended the meeting of the Southern African Regional Committee for the Conservation and Utilization of the Soil held in Lourenco Marques during June, 1958. This was again a most successful meeting and the discussions proved valuable and constructive. All member territories presented progress reports and it was gratifying to learn of the steady developments taking place throughout the Southern African Region.

The meeting was followed by a tour of the southern part of Mocambique which was indeed most interesting and informative. The intensive development of the Limpopo and Komati Valleys was an interesting study and the Mocambique Government and technicians deserve much credit for this work.

NORTHERN RHODESIA

1. ORGANIZATION

The year under review has been one in which minor changes had to be made in the organization to enable further consolidation to be effected. With the exception of one officer on a technical grade, all the European staff were on Federal terms of service.

(a) **Head Office**

The administrative section was strengthened and there is no doubt that this will have beneficial effects on the efficiency of the Department.

(b) **Intensive Conservation Areas**

For various reasons it was necessary to re-define the boundaries of a number of Intensive Conservation Areas. Only one new area was declared. There are at present 24 declared Areas.

The position at present is as follows:—

(i) Declared during the year: One, viz. Mumbwa.

(ii) Investigated or under investigation for declaration: Chingola; Bancroft; Ndola; Luanshya; Kitwe; Mufilira.

(iii) Subdivision of Areas during the year: Nil.

(iv) Investigated or under investigation for subdivision: Nil.

(v) Boundaries Changed: Areas 1-22 below.

(vi) Investigated or under investigation for Boundary changes: An area South East of Chilanga I.C.A. for inclusion in that I.C.A. This portion has now been gazetted and included, involving the addition of a very considerable area with possible necessary subdivisions at a later stage.

(vii) Areas Declared:

1. Livingstone	Zambesi Group
2. Zimba (South Kalomo)	
3. North Kalomo	
4. Choma South	
5. Chomo North	
6. Monze-Pemba	Mazabuka Group
7. Magoye	
8. Lower Kaleya	
9. Upper Kaleya	
10. Mazabuka	
11. Nega Nega	
12. Chilanga	Lusaka Group
13. West Lusaka	
14. East Lusaka	
15. North Lusaka	
16. East Chisamba	Chisamba Group
17. West Chisamba	
18. Mwomboshi	
19. Mumbwa Concession	
20. South Broken Hill	Broken Hill Group
21. North Broken Hill	
22. Mkushi	
23. Chingola and undeclared Copperbelt Areas	Copperbelt Group
24. Fort Jameson	Fort Jameson Group

Districts at present not served by I.C.A Committees are parts of the Copperbelt, Abercorn and scattered farms in the Northern, Luapula and North Western Province.

(c) **I.C.A. Committees**

Due largely to the improved staff position of the Department and the enthusiasm of the Natural Resources Board, the I.C.A. Committees were stimulated and well. Local difficulties in one area caused the committee to resign but after a very short period without a committee the farmers in the district appreciated its value and a new one was elected.

The enthusiasm of the Committees was clearly demonstrated when a team of intergovernmental officials and representatives of the Agricultural Lands Board, Agricultural Land Bank, Rhodesia Tobacco Association and the Rhodesian

National Farmers' Union visited each I.C.A. on the line of rail, and over two thirds of all the active farmers attended the meetings.

Particular efforts were made by the Committees in the areas where Regional Plans were in operation and as a result of their endeavours much additional work was carried out.

Regular meetings were held by Committees and programmes of work and problems were fully discussed. Field days were numerous, of a high standard and well attended.

(d) **Group Organizations**

The Group organization is fully established over the country but certain Group Committees are not yet completely developed. In time it is anticipated that the latter will play an important rôle in Northern Rhodesia.

Several Group Committees issued news letters that were distributed among all landowners in the Groups; they proved of considerable value.

2. STAFF

The year was a particularly happy one so far as the staff position was concerned, and all posts were filled. One professional officer resigned to go farming on his own account and one was transferred to Southern Rhodesia for health reasons. The Farm Superintendent of the Msekera Experimental Farm transferred on promotion back to the Northern Rhodesia Service.

Difficulties have arisen, however, as a result of the very great demand for the services of the Department from farmers, the Natural Resources Board, the Agricultural Lands Board and Northern Rhodesia Government Departments.

Several areas had to share Conservation officers and whilst the present number of farmers concerned does not justify additional staff normally, the distances to travel between and within areas, together with the great demand for work, indicates that a few additional Conservation Officers will be required in the near future.

African Survey Orderlies did good work and assisted considerably but their numbers could be increased with considerable advantage to assist with routine work.

The following table gives details of the staff:—

	Authorized 30.9.58	*Requirements*
Head Office		
Regional Director	1	1
Regional Conservation and Extension Officer	1	1
Senior Animal Husbandry Extension Officer (seconded)	1	1
Senior Tobacco Extension Officer	1	1
Senior Conservation Engineer	1	1
Irrigation Officer	1	1
Horticulturist (seconded)	1	1
Poultry Officer (seconded)	1	1
Soil Chemist (seconded)	1	1
Senior Executive Officer	1	1
Higher Executive Officer	1 (temporary)	1
Clerical Officers (Administration)	5	5
Stenographer	1	1
Typist	1	1
Clerk Typist	1	1
Higher Executive Officer (Accounts) (Seconded)	1	1
Clerical Officers (Accounts) (2 seconded)	2	2
Planning Team		
Planning Officer	1	1
Conservation Officers	2	2
Agricultural Topographers	2	2
Field Staff		
Additional Regional Conservation and Extension Officer	1	1
Group Conservation and Extension Officers	8	8
Conservation Officers	16	16
Animal Husbandry Officer (seconded)	1	1
Clerical Officer	1	1
Experimental Farms		
Managers, Supervisors, Assistants	7	7
Working Account		
Mechanical Engineer	1	1
Senior Mechanical Supervisor	1	1
Storekeeper	1	1
Mechanical Superintendants, Mechanics	Variable according to volume of work from time to time.	

BRANCH III

	Authorized 30.9.58	*Requirements*
African Staff		
African Agricultural Assistants	6	—
Clerks	4	6
Survey Assistants	6	12
Agricultural Assistant (Eurafrican)	1	1
	17	19

BRANCH IV

	Authorized 30.9.58	*Requirements*
Agricultural Capitaos	13	—
Survey Orderlies	10	30
Carpenters	2	—
Drivers	6	1
Telephone Operator	1	1
Office Orderlies	2	4
	34	36

(a) **Visits to Other Countries**

Mocambique. The Regional Director attended the Sixth Meeting of the Southern African Regional Committee for the Conservation and Utilization of the Soil held in Lourenco Marques from the 11th to the 13th June, 1958, as an observer.

Kenya. The Additional Regional Conservation and Extension Officer extended his leave to visit various centres of agricultural interest in Kenya and submitted a report on his return.

United States of America. The Planning Officer (Mr. J. Mackenzie) is on a study tour of the United States.

United Kingdom. Mr. Mackenzie visited several centres of international agricultural repute in Britain, prior to proceeding to the United States.

(b) **Committees**

Officers served on the following Committees and Boards during the year:—

(i) Credit Co-ordinating Committee—Regional Director (Member).

(ii) Farmers' Debt Adjustment Board—Regional Director (Member).

(iii) Eastern Province Loans Co-ordinating Committee—Regional Director and Senior Tobacco Extension Officer (Members).

(iv) Natural Resources Board—Regional Director and Regional Conservation and Extension Officer (Advisory).

(v) Education Sub-Committee of the Natural Resources Board—Regional Director (Member).

(vi) Drainage Sub-Committee of the Natural Resources Board—Regional Conservation and Extension Officer, Senior Conservation Engineer (Members).

(vii) Agricultural Lands Board—Regional Director (Member).

(viii) Livingstone Area Sub-Committee of Land Board—Regional Director (Member).

(ix) Livingstone Dairy Sub-Committee—Regional Director (Member).

(x) Abercorn Sub-Committee—Regional Director (Member).

(xi) Water Board of Northern Rhodesia—Irrigation Officer (Advisory).

(xii) Livestock Improvement Committee—Senior Animal Husbandry Officer (Chairman).

(xiii) Livestock Improvement Board—Senior Animal Husbandry Officer (Member).

(xiv) Copperbelt Special Area Committee—Additional Regional Conservation and Extension Officer (Member).

(xv) Copperbelt Lands Advisory Committee—Additional Regional Conservation and Extension Officer (Advisory).

In addition to these, the Regional Director and various specialist officers attended meetings of Council and Commodity Committees of the Northern Rhodesia Branch of the Rhodesian National Farmers' Union.

3. TRANSPORT

In general, the transport situation was satisfactory as practically all the officers used private vehicles. However, the official vehicles now held at Groups are in need of replacement.

4. EXPENDITURE

Vote	Item	1957/58		1958/59 Authorized and Anticipated Expenditure
		Authorized	Actual	
39/2A	Salaries and Wages	£84,211	£85,828	£86,558
B	Subsistence and Travel	4,640	6,862	7,080
C1	Books and Periodicals	100	24	70
C2	Camp Equipment	50	41	170
C3	Leave Entitlements	1,300	1,865	970
C4	Office and Miscellaneous	900	1,474	1,740
C5	Instruments	1,550	1,036	380
C6	Recruiting	100	—	50
C7	Water, light, etc.	120	40	130
D	Postal Services	630	1,478	1,630
E1	Chalimbana	6,500	5,819	5,330
E2	Kambowa	7,630	7,078	6,720
E3	Mochipapa	5,800	5,553	5,630
E4	Msekera	8,000	5,430	5,650
F1	Increase working Capital	35,000	35,000	—
F2	Replacement of Assets	5,000	2,594	580
G	Conservation Works and Measures	3,500	1,229	1,300
H	Transport	24,070	23,858	24,800
J	Housing (construction)	18,000	17,062	4,000
K	Transfer Adjustments	1	614	1
	TOTALS	£207,102	£202,885	£152,789

5. GENERAL AGRICULTURAL CONDITIONS

(a) **Climatic Conditions and General**

The year under review was the worst that has ever been recorded in Northern Rhodesia. An extremely hot and dry period extended until the middle of December, ploughing was extremely difficult and virtually impossible in certain parts of the maize areas until the rain came. The pattern of rainfall was almost the reverse of the average for the country as a whole. Livingstone in the south-west with an average of 27 inches recorded 50 inches, and the Copperbelt, with an average of 50 inches, recorded 30 inches. These rains fell almost incessantly from mid December until mid February/early March when they ceased abruptly. During this period there were only one or two days of sunshine. Ploughing, planting, cultivation and top dressing were all affected.

The ground was packed hard by rain which caused a large proportion of the water to run off; very little percolated as was obvious when the rains ceased. There was insufficient ground moisture to carry the crops on to productive maturity and it was not possible to plough some of the heavier soils a few weeks after the end of the rains. In general, the worst affected areas were along the line of rail from Livingstone to Chisamba.

(b) **The Financial Position**

Primarily due to the adverse season farmers found themselves in grave financial difficulties and, early in 1958, the indications were that some financial assistance would have to be given to the farming industry if the 1958/59 crop was to be planted. As a preliminary measure, the Northern Rhodesia Government set up the Credit Co-ordinating Committee which included the Regional Director of Conservation and Extension as the Ministry's representative. This Committee had no legal powers or finances and could work only with voluntary agreements. This eventually proved unsatisfactory when certain traders would not co-operate. The Committee did, however, marshall the facts of the position for the two Governments.

A very similar position was arrived at as had been experienced in the mid 1930's in Southern Rhodesia, when legislation had to be passed. The Northern Rhodesia Government moved with commendable speed and the Farmers' Debt Adjustment Ordinance was passed with a Board, representing both Governments, Trade and the Farmers, taking over from the Credit Co-ordinating Committee.

The duties of this Board are to ensure that no experienced and capable farmers will be forced off the land due to financial difficulties, unless these

difficulties are of unrealistic proportions. Where possible, cases are dealt with on a voluntary basis and only the exceptional ones are brought under the Ordinance.

The Department besides giving general technical advice has been very actively concerned with the matter and has provided a large number of reports and preliminary farm plans, and detailed farm plans are following for all those who come under supervision.

Early in September the Director, the Regional Director, the Chairman of the Farmers' Debt Adjustment Board (also Chairman of the Northern Rhodesia Branch of the Rhodesian National Farmers' Union and of the Agricultural Lands Board) with representatives of the Agricultural Land Bank and Natural Resources Board toured the line of rail area from Broken Hill to Livingstone. Meetings of farmers in every I.C.A. were attended at which the position was explained and the assistance available, both financial and advisory, was outlined. These meetings were exceptionally well attended, from 50 to 100 per cent. of the farmers in the various areas being present.

In the tobacco areas, two or three farms were selected in each I.C.A., and meetings of the local farmers are being held every two weeks on these farms to discuss the growing of the crop stage by stage. In the maize areas, similar meetings are being held every three or four weeks. Other problems in relation to potatoes, milk, vegetable production, etc. are dealt with on request. Considerable attention is paid to land selection as well. So far, field days have been generally well attended, and there is little doubt that farmers, with assistance given by the Department, are making an 'all out' effort to ensure record crops—weather permitting.

(c) **Crop Production**

(i) *Food Crops. Maize.* As mentioned above, due to the season, ploughing and planting were late; cultivation and the application of fertilizers (particularly top dressings) were impeded and frequently eliminated. Low yields can be attributed to poor land selection, shallow ploughing, plough pans and the lack of good green crops in previous years. Non-utilisation of hybrid seed and lack of ridge and furrow ploughing contributed as well to unsatisfactory production. In addition, the heavy rains appeared to have upset pollination as in many crops little, if any, grain was formed. These crops were usually salvaged as silage. A gale which swept from Livingstone to Fort Jameson also ruined many crops.

A few farmers managed to grow reasonably good crops by the use of top dressings.

Sorghums. A slight increase in the amount of sorghum normally grown was planted this year, but the results were poor due to the adverse season.

Potatoes. The summer crop was almost negligible and the early irrigated crops were seriously affected by poor and diseased seed. Later plantings, however, have improved and fairly good yields are expected. It is anticipated that a considerable acreage of potatoes will be planted early next year which may result in a glut. The first growing of certified seed potatoes in Northern Rhodesia (Pimpernel variety) was inspected and certified. Average yield was 80 bags/acre.

Vegetables. Production is still unreliable but is improving—especially during the rainy season. An encouraging factor is that more growers tried vegetable culture, especially tomato production, during the rains with reasonable success.

Wheat. About 400 acres of wheat were grown and are in good condition with little disease. The average yield of the entire crop will be in the vicinity of 8 bags/acre.

Fruit. Little increase in the growing of subtropical fruit can be reported and in spite of suitable climatic factors, farmers are not interested in increasing production. This is unfortunate as the local market demands are not being met.

Citrus production is increasing, especially in the Copperbelt and Lusaka/Chisamba areas. The quality of the fruit is generally poor, due probably to incorrect fertilizer applications and ignorance of pest and disease control.

Other food crops not mentioned are grown in very limited amounts.

(ii) *Cash Crops. Tobacco.* In most of the tobacco areas the general rains commenced only after the first week in December, except in Kalomo and Livingstone where rain fell in early to mid November. After that, the pattern was much the same throughout the country except in the Fort Jameson and Mkushi areas where conditions were more favourable. In general, progress was disappointing

despite the fact that officers of the Department gave particular attention to their tobacco advisory duties. The most common failing was the lack of supervision to ensure attention to detail of most crop management practices.

The main factors, (other than the adverse weather conditions) responsible for the disappointing crop, are summarized as follows:—

(a) Generally poor seedbeds due to sowing them too thickly with too much leafy and dense grass mulch.

(b) Poor, uneven stands in the early planted crops.

(c) Topping and suckering operations on the early planted uneven stands were largely done fractionally and more often done late.

(d) Reapings were difficult and early plantings clashed with later planted reapings.

(e) Frogeye and Angular leaf spot diseases built up rapidly in all areas at the end of January, and practically reached epidemic proportions during February when secondary growth became a problem. Growers tried reaping ahead of these diseases, straining the available barn accommodation.

(f) Most areas experienced difficulty with curing. A considerable amount of bodied leaf turned into dark brown and blotched nondescript tobacco. Many farmers continued to overpack their barns due to inadequate accommodation. Barnspot caused the most damage, following the severe infestation of Frogeye disease.

Although progress was achieved in the North Eastern area, the problems as reported during the last three years remained the same. However, the introduction of the subsidy on the tobacco in this area has given the growers a big incentive of the subsidy on the tobacco in this area has given the growers there a big incentive to improve the quality of their crop. The area finally sold 1,062,000 lb. of flue cured tobacco from about 1,900 acres giving an average yield of 560 lb./acre.

All statistics for the North Western area are now combined with those of Southern Rhodesia. The exceptionally poor crops almost generally produced are reflected in the estimated average yields achieved. In the areas from Kalomo to Chisamba the average yield per acre was about 550 lb. In the Broken Hill area it was about 650 lb./acre whilst even further north in the Mkushi area it was about 800 lb./acre. In all areas there were few growers who achieved yields of over 1,000 lb./acre. The general quality of the crop consisted largely of bright, thinly textured tobacco. The percentage of perished and nondescript grades was probably the highest for many years. The inadequacy of handling and other facilities was most obvious during the year.

Burley Tobacco. Apart from the trials carried out in North Western Rhodesia, this type of tobacco was grown only in North Eastern Rhodesia but most crops suffered severely from drought conditions. The crops grown under Tenant African labour on a large scale gave better results than where it was grown on a small scale with normal labour.

Apart from the poor handling from which many of the crops suffered, there occurred a marked recession in the Burley prices at the Limbe sales and the majority of growers suffered severe financial losses.

Grass Seed Production. Apart from the set back during the past season, indications are that grass seed production will increase as a number of farmers have now grown the seed successfully, and intend joining the Pasture Seed Growers' Association. In vegetable and potato seed production farmers have also shown interest.

Green Crops and Legumes. Very few of these crops were planted and only a small proportion of those planted could even be termed satisfactory. Normally the farmers tend to plant their green crops far too late in the season and then without adequate fertilizer applications.

(iii) *Stock Feed.* The production of silage from maize still forms the bulk of Northern Rhodesia's preserved winter stock feed. Only limited quantities of legumes were mixed with the maize. Napier Fodder and Rhodes Grass silage were also used to a certain extent but Rhodes Grass silage will probably increase in the near future. Limited amounts of legume hay and grass hay were able to be made this year but indications are that a considerable increase in grass pastures will be planted during the next few years.

Lucerne is becoming increasingly popular as a winter supplement on a number of dairy farms and is doing reasonably well. Grass-clover mixtures are being tried on several farms in Northern Rhodesia, including ten acres at the Chalimbana Experimental Farm.

(d) **Livestock**

The past season was not very favourable for livestock due to the late commencement of the rains; in certain areas water supplies were beginning to fail before the rains began, with consequent suffering to cattle. The high rainfall during the summer months produced coarse rank grazing, and the abrupt termination of the rains left only poor grazing available for winter.

(i) *Cattle. Beef Cattle.* There has been a marked improvement in the management of ranch stock and much more attention is being given to routine stock management.

Interest is being shown in Zebu cattle and the Boran has been crossed successfully with Africander type cows. Angoni cattle are in extremely short supply which is most unfortunate as the breed is indigenous to the Eastern Province and could form the basis of beef herds in many areas.

Good ranch bulls continued to be in short supply and breeders of good type cattle are being encouraged to retain their better bull calves for breeding purposes.

Many farmers who intended supplementing their weaners during the winter period were unable to do so due to the lack of fodder and finance.

Dairy Cattle. Due to the efforts of the Dairy Branch, a great improvement has taken place in the quality of milk produced.

Milk production has increased at a far greater rate than was anticipated despite the fact that there are fewer producers than in the previous year. Several farmers are contemplating establishing dairy herds, but will no doubt be discouraged by the lower milk prices which have prevailed due to certain dairymen concentrating on winter milk production, and thereby producing in excess of the whole milk requirements.

A general improvement in the housing and management of calves is required for, in all too many cases, the young stock are badly housed and are allowed to remain in the vicinity of the cow-byres and dairy instead of in clean, shady, well watered grass paddocks. Accommodation for dairy bulls is generally non-existent and without a strongly constructed bull pen and yard, hand serving is difficult to put into practice and farmers are subjecting themselves and their families to risk of attack.

The difficult rainy season resulted in a negligible quantity of legume crops being planted. Interest is being shown in the use of irrigated crops to provide green, protein rich supplements which will assist in reducing the amount of concentrates that have to be fed.

Milk recording is now in progress in the Chisamba, Lusaka and Mazabuka districts.

(ii) *Sheep.* Sheep thrive in Northern Rhodesia (especially where small flocks are kept) but despite this fact the number of flocks is low.

The Dorper is becoming more popular and rams are now available in the territory.

(iii) *Goats.* Flocks of goats are kept to supply meat for rations and for sale to Asiatics.

On the Copperbelt there is a need for milch goats to supply small-holders with their own milk requirements. Three or four good milch goats would provide ample milk with very little capital expenditure, whereas to run two dairy cows presents many difficulties, not the least of which is securing the services of a bull, with the attendant risk of disease.

(iv) *Pigs.* The complete breakdown of marketing arrangements during the year led to the setting up of a Pig Co-operative which forwards live pigs by road to Salisbury for processing. This and the small amount of cheap low-grade maize on offer increased the cost of production. These factors have all affected the interest which was being shown in pig production and a fall in the numbers of this livestock can be expected.

(v) *Poultry.* The production of table birds increased but producers will have to pay far more attention to dressing and presentation if they wish to find markets.

One firm is attempting to ease the annual glut of eggs by hiring cold storage facilities.

(vi) *Good Cattle Production Bounty.* During the year ending 30th June, 1958, 286 applications were received of which 250 were approved. This involved the inspection and branding of 17,085 yearlings.

The scheme came into operation in 1948, and the amounts paid out annually to farmers since then are shown below.

	Number of Applications	*Number Approved*	*Cost (in pounds)*
1948 . . .	106	106	£10,866
1949 . . .	115	112	£12,390
1950 . . .	97	85	£11,008
1951 . . .	133	121	£10,991
1952 . . .	152	152	£11,057
1953 . . .	198	196	£25,771
1954 . . .	230	230	£29,138
1955 . . .	266	264	£32,067
1956 . . .	291	286	£37,687
1957 . . .	286	250	£30,740

As from 1957, the Scheme was administered and the inspections carried out by this Department; before that date it had been administered by the Northern Rhodesia Department of Veterinary Services.

(vii) *Livestock Improvement Scheme.* The Committee advised the Minister on the allocation of the quotas for the importation of cattle from the Union of South Africa.

The quota available was:—

Pedigree Dairy Female Stock	120
Grade Dairy Female Stock	725
Pedigree Beef Female Stock	50
Grade Beef Female Stock	75

There were no restrictions placed upon the exportation of pedigree bulls from the Union of South Africa.

The demand for grade dairy stock exceeded the quota but owing to the outbreak of Foot and Mouth Disease in the Union of South Africa, only some 390 head of cattle were imported.

Applications for grants under the Livestock Improvement Scheme were received from 165 farmers of which 123 were approved. The payment of a 25 per cent. Railage Rebate on the charges involved in importing cattle was continued.

The Friesland Cattle Breeders' Society and the Africander Cattle Society inspectors visited members in Northern Rhodesia.

Inspections of Pedigree Jerseys will be carried out in future by this Department.

6. PRODUCTION FROM IRRIGATION

There has been steady progress in the number of correct layouts for both flood and spray irrigation that have been established. There remains, however, a need to improve the efficiency of existing layouts.

Water Boards. The Irrigation Officer attended twelve enquiries in various parts of the territory in a technical capacity and as a nominee of the Director of Agriculture.

Kafue Pilot Polder. Advisory visits were continued through the year. Flood irrigation trials were run but had later to be discontinued due to the breakdown of the main pumping system. From March to August the Polder was inundated by the excess Kafue floods and a complete season lost to cropping and irrigation in consequence.

Irrigation Courses. The intensive two week irrigation course was attended in Salisbury in June. Three courses were held in Northern Rhodesia in September. 35 officers attended these courses which consisted of 21 Conservation staff, 11 officers from the Department of Agriculture, two Land Settlement Officers and one member of the staff of the Kafue Pilot Polder. The benefit of these courses will undoubtedly be felt in the improvement of layouts and irrigation techniques in the future.

7. SOIL CONSERVATION

(a) Arable Areas

(i) *General.* Slow but steady progress is being maintained in the protection of arable lands. With the increasing amount of work now being undertaken by the staff, a definite period during the year is being set aside for this all important work. There is a considerable amount of pegging yet to be done and it is hoped to catch up with the backlog in the near future.

Besides the mechanical protection of arable lands, the importance of cover on the land during the rains (particularly on the heavy maize soils) to protect the soil is being continually stressed by field staff.

Sound land selection and better crop and soil management such as crop rotations incorporating grass leys, high plant populations, correct fertilizer applications, better ploughing, management and drainage of the soils and early planting, all form part of the basic principles of erosion control. Due to the adverse season farmers have been unable to put some of these measures into practice but they are becoming increasingly conscious of the need for them and of their importance.

(ii) *Mechanical Protection of Arable Lands.* Progress was maintained during the year as shown below:—

Group	Contours Distance (in yards)	Storm Drains (in yards)	Roads	Waterways	Irrigation Furrows
Copperbelt/Broken Hill .	57,774	7,016	156,319	2,683	21,080
Lusaka/Chisamba . . .	451,909	22,617	9,240	46,300	80,368
Mazabuka	167,655	63,138	18,380	1,300	700
Zambesi	403,856	400	210,136	—	470
Fort Jameson	94,179	7,502	5,070	—	—
1957/58	1,175,373	100,673	399,144	50,283	102,618
1956/57	913,700	133,800	149,200	—	—

The figures for contouring show a slight increase over the 1956/57 figures. In addition to these works, a considerable number of contour surveys were carried out as a preliminary to the implementation of drainage systems on the land. Fields were laid out according to conservative principles and a total of 3,335 acres of land were stumped for farmers by Mechanical Units of the Department.

(iii) *Roads.* The correct alignment and drainage of all roads still plays an important part in the work of the Department. A total of 256 miles of farm and Road Board roads were realigned or new roads surveyed.

(iv) *Drainage.* During the past abnormally heavy rainy season, the need for correct land selection and cultural practices was clearly demonstrated. A large number of lands had been ploughed which should have been left untouched. In order to try and help alleviate the position, a considerable amount of work was carried out by the Department on land selection and the laying out of a ridge/furrow system of cultivation. Numerous surveys were completed and farmers started the ridge and furrow method of ploughing their lands. As there are large areas of flat land with a "wetness' factor in Northern Rhodesia, soil selection and ridge and furrow cultivation will continue to form an important part of the function of the Department. African Survey Assistants greatly facilitate the laying out of this work by carrying out contour surveys and it is desirable that more of them should be made available.

A team of specialists investigated the drainage problem in West Chisamba and a report dealing with this problem was submitted to the Natural Resources Board and copies sent to all I.C.A. Committees.

An experienced officer was sent up from Southern Rhodesia and his assistance in ridge and furrow layouts was most helpful.

(b) Grazing Areas

(i) *General Management.* Definite progress has been made in the general management of our veld which can be attributed largely to the Regional Planning and Good Cattle Production Bounty loans and subsidies for fencing and water supplies. Although progress has been made in this direction and numerous paddocks have been constructed, more emphasis must still be placed on correct management of the veld within these paddocks. Winter grazing areas in certain

localities are being grazed at the wrong time of the year to the detriment of the grass cover. Increased watering points within the paddocks will also have to be provided.

(ii) *Veld Fires.* A big drive was made in this connection to try and reduce the incidence of veld fires and some of the I.C.A. Committees which undertook this work achieved good results. The Natural Resources Board placed the responsibility for fire control on the farmers but also drew the attention of other responsible bodies such as Native Authorities, Crown Land Administrators and railway authorities to their own responsibilities in this matter. There is still need for increased penalties to be imposed on persons found guilty of causing indiscriminate veld fires.

(iii) *Bush Encroachment.* Little progress can be expected in combating this problem until such time as hot burns are carried out in paddocks that have been rested. While hot burns coupled with grazing control are not the complete answer to the menace, farmers must resort to this method until such time as a better remedy is found. Bush and Lanatana camara encroachment difficulties are receiving attention but it is felt that local authorities and the farmers themselves could in many cases initiate action for the control of this problem.

8. WATER CONSERVATION

The following table shows particulars of dams built in the various Groups:—

DAMS CONSTRUCTED 1957/58

Group	*No.*	*Other Units* Gallons	*No.*	*Conservation Units* Gallons
Copperbelt/Broken Hill	7	26,250,000	—	—
Lusaka/Chisamba	—	—	22	30,100,000
Mazabuka	—	—	4	6,250,000
Zambesi	10	33,040,000	15	66,650,000
Fort Jameson	—	—	—	—
1957/58	17	59,290,000	41	103,000,000
1956/57	10	22,080,000	47	114,886,000
1955/56	—	—	24	84,000,000

	Total No.	*Total Capacity*
1957/58	58	162,290,000 gallons

Finance remained the limiting factor in water conservation, approximately 43 of the 58 dams constructed during 1957/58 being financed from Regional Planning funds. Due to the past adverse season it is most probable that the majority of the dams to be built this coming season will be those in regionally planned areas. It is evident that water conservation, whether for irrigation or stock watering, must be given high priority in Northern Rhodesia during the next few seasons.

9. MECHANICAL UNITS

During the year a Mechanical Engineer was appointed to supervise the complete organization of the mechanical units and the workshops. This was a great step forward and can have nothing but beneficial effects.

(i) *Maintenance.* Breakdowns, with consequent loss of hours, were still too frequent in spite of the age of some of the machines. A significant feature, however, was that spares consumption over the year was reduced from £2 to approximately £1 2s. 6d. per working hour. This was due largely to the improved maintenance and operation of the units by supervisors.

(ii) *General Report on Tractor Units.*

(a) *Strength:*

10 Caterpillar D7 tractors
1 Adams motorized grader
8 9 cu. yd. scrapers
7 rippers
1 Towed grader
1 Bush clearing chain.
2 Low loaders
6 Lorries

plus minor equipment and light vehicles.

(b) *Work Done (Field Groups).* The most important work carried out during the year was on the Mkushi Land Settlement Scheme. Approximately 1,100 acres were cleared and windrowed, and 43 miles of district roads, 47 miles of farm roads and 13 miles of storm drains built.

Other work consisted of the construction of dams, storm drains, and roads in the East Lusaka, Kalomo and Mazabuka Regional Planned areas, bush clearing for private applicants, and tsetse belt clearing for the Department of Game and Tsetse Control. In all cases, complete satisfaction was given to applicants.

(c) *Analysis of Working Hours.* Out of a possible maximum of 24,120 work hours, the tractors performed 11,620 hours, or 48 per cent. of the maximum. This represents an average output of 96.8 hours per tractor month, a falling off of last year's output by about 13 per cent. The reasons for this reduction are as follows:—

(1) There was no large concentration of work which involved little movement of the machines.

(2) There were periods when work on hand was insufficient to keep all tractors employed.

(3) Unfavourable weather conditions. Not only was work held up through the intensity of the rains while they lasted, but the early end of the rains, with consequent drying-off of the lands, curtailed the bush clearing season.

(4) Breakdowns, mainly through the age of the tractor fleet. An approximate breakdown of the hours lost is as follows:—

Hours worked	11,620	48%
Moving	1,700	7%
Broken down	3,600	15%
Weather	1,900	8%
Awaiting work and time lost on rail	4,100	17%
Other causes	1,200	5%
	24,120	100%

N.B.—The above excludes servicing hours.

(d) *Financial Statement.* For the year ended 30th June, 1958, the losses to Working Account amounted to approximately £11,700—as against £45,000 for the previous year. This has been achieved in spite of a reduction of working hours, and the charging to Working Account of items such as the Accountant's salary, etc. Reasons for this reduction in losses are, in the main:

(i) The disposal and transfer of surplus equipment.

(ii) Lower expenditure on spares and maintenance of tractors.

(iii) Reductions in European and African labour.

(iv) Curtailed use of transport.

(v) Greater all-round efficiency.

Unfortunately the position is likely to deteriorate in the coming year. The present financial stringency, together with the very bad season that has been suffered by farmers will result in reduced employment for the tractors.

10. FIELD TRIALS

The following field trials were carried out in conjunction with the Department of Research and Specialist Services:

Maize Variety, 3; Maize Fertilizer, 4; Burley Tobacco Variety, 4.

Unfortunately the difficult season affected the trials most adversely. Potato variety trials were also carried out which yielded valuable information. Further variety as well as fertilizer trials on potatoes will be established during the coming year.

For the coming season, proposed trials and demonstrations approved by the Field Experimentation Committee will be carried out in respect of:—

Maize-fertilizer and variety

Groundnuts-fertilizer

Drainage (demonstration)
Pasture (demonstration)
Soya Beans (demonstration)
Kenaf (demonstration)
Sugar Cane (demonstration)
Lucerne (demonstration)
Livestock (demonstration)

11. ADVISORY SERVICES

(a) General

Every year this aspect of the Department's work increases considerably indicating that farmers are seeking advice and guidance to a much greater extent than in the past. The table below indicates the number of visits undertaken by field staff and specialist officers attached to the Department in Northern Rhodesia. In many cases the figures show large increases over those for 1956/57.

From time to time, staff of the Department of Research and Specialist Services visited Northern Rhodesia to assist with special problems, or to give talks at field days. Their assistance was much appreciated.

(b) Visits Made by Officers of the Department

Meetings Attended:	
1. I.C.A. and Group Committees	357
2. Farmers Associations	94
3. Road Board	58
4. Staff — Groups and Regional	189
5. Visits with Committee Members	139
6. Young Farmers' Clubs	74
7. Miscellaneous	345
8. Agricultural Lands Board	45
9. Natural Resources Board	28
10. Regional Conferences (Salisbury)	10
11. Farmers Debt Adjustment Board	6
12. Credit Co-ordination Committee	5
Inspections:	
1. Regional Planning	440
2. Other Conservation Subsidies	13
3. Water Board	46
4. Agricultural Lands Board	286
5. Livestock Improvement and Good Cattle Production Bounty Schemes	503
6. Cattle Bank	23
7. Dairy Bonus	93
8. Land Bank	50
9. Seed Association	27
10. Tobacco Grading Sheds	68
11. Pest Control	2
12. Miscellaneous	515
Advisory	
1. Regional Planning	619
2. Farm Planning	372
3. Extension	1,546
4. Pegging	732
5. With Irrigation Engineer	100
6. Irrigation Layouts	79
7. Mechanical Units	365
8. Experimental Station	147
9. Field Days	236
10. Road Boards, etc.	167
11. Tobacco Advisory	1,721
12. Miscellaneous	815
TOTAL	10,315

(c) Field Days

A record number of 135 field days were held at which the total attendance was 3,330. These field days are definitely playing a very useful role in conveying new methods and ideas to farmers. Some of these gatherings included quizz evenings and discussions at which slides were shown. The items covered dealt mainly with maize, tobacco, horticulture, dairy and beef production.

(d) Shows

Despite the adverse season, some of the sections were well supported and once again the livestock side of the shows, especially at Lusaka, was well up to standard. The two shows on the Copperbelt—one at Ndola and the other at Kitwe—were most successful.

(e) **In-Service Training**

More emphasis was given to in-service training during the past year. A refresher course in Farm Planning, and an Animal Husbandry course were held in Lusaka. Several specialists from Southern Rhodesia attended and this helped to broaden the subjects being discussed. Short irrigation courses were also held in Mazabuka, Lusaka and Ndola. An index of the value of these courses can be gauged from the fact that personnel from other departments also attended and joined in the discussions which took place. It is hoped to continue them next year and to hold, in the different groups, a series on cattle especially for farmers.

One officer completed a full season on tobacco training in Southern Rhodesia and a further officer is undergoing training at the moment.

(f) **Teachers' Courses**

The first real steps were taken in this direction when, during the year, two one-day courses on Conservation were held under the auspices of the Natural Resources Board's Sub-committee on Conservation Education. Teachers from Lusaka were given lectures and taken out into the field. It is intended to extend this series of courses to include all the larger centres in Northern Rhodesia.

Northern Rhodesia is to be congratulated on starting this excellent method of training teachers.

(g) **Young Farmers' Clubs**

Progress was made in this sphere and during the year the Senior Y.F.C. Organizer from Southern Rhodesia toured Northern Rhodesia from Livingstone to the Copperbelt, visiting all the European Schools en route. The Irrigation Officer in Lusaka, who is acting as a part-time organizer, accompanied the Senior Y.F.C. Organizer on his tour. Conservation Officers assisted with technical guidance and helped in arranging tours of some of the Clubs to various farms in their areas.

Seven clubs are now in operation in Northern Rhodesia and personal contact has been established with each of them.

There is no doubt that the movement could have a most beneficial impact on the territory's farming future provided that it is guided adequately and encouraged to develop.

12. PLANNING

(a) **Regional Planning**

As a result of the experience gained during the three-year experimental period which terminated on the 30th June, 1957, the conditions under which the scheme is administered were revised.

The principal points of difference between the old and the new conditions are:—

(i) The time limit of three years for the implementation of plans has been abolished. This provision not only made the control of expenditure extremely difficult but had the disadvantage of forcing the pace of development on certain farms too fast, whilst retarding development in areas which had not been planned. To overcome this Regional Planning will, in future, be undertaken in two stages, viz.

Stage I: Communal Plans. These plans will relate to works of national importance which will be implemented on a priority basis in the national interest. In other words, once a plan has received the approval of all farmers directly concerned the date and manner of its implementation will be decided by the Government in consultation with the Board.

Stage II: Farm Plans. These plans will relate to works which, although essential to the scheme, are of major benefit to the farmer, and in consequence will be implemented only when the farmer needs the works. It is emphasized, however, that the implementation of all plans (Communal and Farm) will be subject to the availability of funds and in consequence farmers desiring to proceed with Farm Works must seek approval before proceeding to implement their Farm Plans.

Despite the change in nomenclature, which has been adopted for the sake of clarity, both Communal and Farm Plans are regarded as part of *Regional Plans* for the purposes of the new Conditions.

(ii) The old conditions limited the estimated cost of planning in any particular area to 10s. per acre and in addition works qualifying for subsidy at rates of over 50 per cent. were not to exceed 25 per cent. of the total estimated cost. This arrangement did not take into account the terrain and other varying problems in different areas and, in consequence, in certain localities where works of national importance were few in number or low in cost, the local farmers could receive a greater degree of subsidization in respect of farm works, whereas in other areas essential national works could not be undertaken owing to the ceiling limitation having been reached. To meet this situation under the new conditions Communal Works (that is works of national importance) will, subject to the availability of funds, be undertaken without the operation of an arbitrary limitation. Farm works, on the other hand, will be limited to an estimated total cost per farm assessed at 3s. 9d. per acre. This figure is related to the limitation provided for in the old conditions.

The position in regard to plans commenced during the three-year experimental period is as follows:—

Area	*Acreage*	*Commencement Date*	*Completion Date*
Upper Kaleya	7,728	1.6.54	31.5.58
Middle Kaleya	57,884	1.6.54	31.5.58
Lower Kaleya	70,124	1.8.55	31.7.58
West Lusaka (Cheta River)	31,121	1.9.54	31.8.58
West Lusaka (Chilangola)	61,008	1.9.54	31.8.58
North Broken Hill	110,161	1.5.55	31.10.58
East Lusaka (Chalimbana)	100,729	1.7.56	30.6.59
Mazabuka	116,987	1.10.56	30.9.59
TOTAL	555,742		

It will be noted from the above that the implementation period of five of the eight plans expired during the year under review. The remaining three will expire during the coming year.

As a result of the activities of the Natural Resources Board, I.C.A. Committees and the Department farmers implemented a large number of works during the past year. In those areas where the time limit has expired, farmers, if they wish to complete further works and qualify for loan and subsidy assistance, will have to apply under the revised conditions covering regional planning when their applications will be considered together with all other applications in the light of the funds available.

The following plans were commenced subsequent to the 30th June, 1957:—

Area	*Acreage*	*Commencement Date*	*Completion Date*
South Broken Hill (Munga River)	41,116	21.4.58	20.4.61
North Kalomo	40,491	22.1.58	21.1.61
South Kalomo (Bowood East)	68,150	(No dates fixed)	
TOTAL	149,757		

It is proposed to cancel the completion dates of the South Broken Hill (Munga River) and Northe Kalomo plans and implement these, too, under the revised conditions.

Planning of the following six areas was in progress during the year:

Livingstone
South Choma
Pemba
West Lusaka (Molendemo I)
Mwamboshi
North Lusaka I

These plans will be submitted to the Natural Resources Board during the next few months. They will, of course, all be implemented under the revised conditions.

It is hoped to complete a very considerable number of Stage I (Communal) and Stage II (Farm Plans) during the coming year, and the necessary steps have been taken to make this possible.

(b) **Farm Planning**

Regional Planning was given priority over farm planning but in addition to the farms planned under the scheme, a fair number of individual farm plans were produced. However, under the revised conditions for Regional Planning in Northern Rhodesia, Stage II will be farm plans similar to those done under the normal farm planning system, and it is probable that a large number of these will be called for as soon as Stage I plans have been completed.

(c) **Miscellaneous Planning and Assistance**

Mkushi. At the request of and in collaboration with the Agricultural Lands Board, the Department was responsible for the planning of that part of the Mkushi area being settled at the moment and to be settled during the next few years.

Copperbelt. At the request of the Commissioner of Lands six areas were carefully surveyed and examined as to their farming potential and recommendations were made for their subdivision into economically sound units.

Abercorn. The area available for European farming also received the attention of the Department.

Mwinilunga Crown Land. A team of specialists consisting of the Director, the Regional Director, the Chairman of the Federal Standing Committee on Agricultural Production, the Chief Planning and Training Officer, the Senior Animal Husbandry Officer, the Additional Regional Conservation and Extension Officer, accompanied by the Provincial Agricultural Officer and Provincial Forestry Officer, visited the area at the request of the Commissioner of Lands. A report will be submitted in the near future.

Other Areas. A considerable amount of work was also carried out for the Agricultural Lands Board investigating the potential of leasehold farms (occupied and unoccupied). Recommendations were submitted as to possible subdivision and indications were given where the most suitable division or divisions should be made.

13. GOVERNMENT EXPERIMENTAL FARMS

The Department remained responsible for the running of the Mochipapa (near Choma), Chalimbana (near Lusaka), Kambowa (near Ndola) and Msekera (near Fort Jameson) Government Experimental Farms. These institutions once more proved of very great benefit to the farmers in the areas served by them as well as the Advisory Officers responsible for their supervision. Not only was valuable experimental work carried out in close collaboration with the Department of Research and Specialist Services and the Tobacco Research Board of Rhodesia and Nyasaland, but it was also possible to demonstrate the application of new research findings as well as numerous practices in the fields of animal, crop and soil husbandry. Field days were also held on the farms and numerous farmers visited them to see the work in progress and to obtain first hand information.

In so far as the Kambowa Experimental Farm was concerned it was decided to transfer the operations to land more centrally situated on the Copperbelt. It is hoped to finalize the transfer during the next few months.

CONCLUSION

In conclusion I wish to express my very sincere appreciation to all members of my staff for their loyal support and devotion to duty during the year.

I also wish to express thanks and appreciation for much valuable assistance and co-operation to the Natural Resources Boards of Southern Rhodesia and Northern Rhodesia, the Intensive Conservation Area Committees, the Rhodesian National Farmers' Union, the Tobacco Research Board of Rhodesia and Nyasaland and the Department of Research and Specialist Services as well as other Departments of the Ministry, the numerous Departments of the Federal, Southern Rhodesia, Northern Rhodesia and Nyasaland Governments.

I would also like to express my particular thanks to the thousands of farmers, whom it was my pleasure and privilege to serve, for their wholehearted and friendly co-operation without which little progress would have been possible.

REPORT OF THE DIRECTOR OF VETERINARY SERVICES FOR THE YEAR ENDING 30th SEPTEMBER, 1958

The Department of Veterinary Services operates with two branches, Field and Research, and the full reports of the Assistant Directors in charge of these branches are given in full.

It is therefore necessary for me only to emphasize and comment on some of the information separately compiled by these officers.

Staff

The staffing strength throughout the various sections has been at a satisfactory level in so far as authorized establishment permits, with the exception of technical assistants in the laboratory. Much of the difficulty experienced in the past in recruiting professional staff has been overcome through making conditions of service more attractive.

It is anticipated that in the very near future professional staff will be up to full strength.

Qualified laboratory assistants present a real problem, however, as do also qualified meat inspectors, as it has not been possible to fill the vacancies in these categories. Animal Health Inspectors also provide a problem—staff can be recruited without undue difficulty, but it is disappointing to note that after having been trained at considerable expenditure of time and energy on the part of the senior and professional staff, they leave to take up more remunerative and less arduous appointments elsewhere.

It is becoming increasingly apparent that, owing to further encroachment of the tsetse fly, with resultant animal trypanosomiasis, and the increasing demand and necessity for Artificial Insemination subcentres, the establishment will require expansion.

Foot and Mouth Disease

In past years outbreaks of this disease were regarded as something to be feared in the Victoria Veterinary District, only one outbreak (Wankie 1940) having started elsewhere. Although an outbreak was recorded in the Nuanetsi Native District in the early part of the year under review, involving two properties, Limburgia and Rinette, the scene has changed in that the Wankie Native District seems now to have become established as the trouble spot. That this was a possibility was predicted in the last annual report. It is, therefore, apparent that regular intensive inspections to detect infection are now as necessary in the Wankie area as in the Victoria lowveld.

The factor common to both these areas is the high game population with resultant cattle/game contact. In the case of Wankie there will for all time be a heavy game concentration in the Wankie National Park. From this, overflow into the adjacent cattle raising areas is inevitable unless steps are taken to bring about separation between the game area and the cattle areas. So long as contact between game, especially during times of migration, and cattle is unhampered infection must be expected to recur in cattle at greater or lesser intervals as it has done during the past 27 years in the Victoria lowveld. Whereas in the latter area it can be anticipated that as development becomes more intensive game will decrease and their movements become more and more restricted, leading to eventual reduction or elimination of the game/cattle contact factor, this cannot be expected in the case of Wankie. The National Park, and thus the game population, must be maintained for all time, and efforts must therefore be directed towards effecting separation between cattle and game and at the same time maintaining a system of inspection to detect any outbreak of Foot and Mouth disease in cattle should it occur.

To this end arrangements are in progress to erect a barrier fence along the southern and eastern regions of the Wankie National Park—this should go a very long way towards establishing sufficient separation between migrating game and cattle to ensure considerable reduction in the danger of infection breaking out and spreading.

Research into Foot and Mouth disease, which inevitably entails the maintenance of active infection, requires complete isolation of the premises. It is therefore, something which cannot be undertaken unless either natural barriers can be used viz. an island, or extremely expensive isolation units established. In Southern Rhodesia neither of these requirements exists and research would only be possible during natural outbreaks of the disease. Fortunately, research institutes in other countries do exist and these are actively engaged in attempts to develop

satisfactory vaccines. The greatest promise seems to lie in the adaptation of the virus to the chick embryo or tissue culture. By such artificial growth the virus may be expected to become so attenuated as to be incapable of setting up the disease and yet fully potent in establishing immunity. Three types of virus, SAT I, II and III, have been recorded in Southern Rhodesia and for full protection vaccines against all three will be required. There is little doubt that these in time will become available.

In the meantime, however, our present policy of early detection, control of outbreaks by cordons and quarantine and virus inoculation of the cattle involved must continue.

Trypanosomiasis

This disease, though less spectacular than any others, can now be regarded as one of, if not the most important with which the Department has to deal. Only one of the eight veterinary districts is not directly involved in trypanosomiasis duties. More and more staff have had to be put on to routine inspections and treatment of stock in the expanding areas of infection. This tendency for tsetse fly to expand is not peculiar to Southern Rhodesia and has been noted to some extent in all the affected African territories. There seems little immediate prospect of a natural regression occurring and active measures to cause the fly to revert to its previous more restricted haunts will certainly take years. One must face up to the fact that for some considerable time to come veterinary staff will have to fight the disease in stock. Fortunately with the present not inconsiderable armoury of drugs at our disposal a successful outcome of the fight is almost assured, given the staff with which to conduct the campaign. But constant inspections, which necessitate the preparation and examination of smears, consume many man hours, to say nothing of the actual drug treatment regime which must be practised to keep the animals surviving.

It has been well established in the past that the efficacy of the different trypanocidal drugs varies from country to country or even in different localities. New drugs are now coming on to the market or being sent out for trials with ever increasing frequency and their direct effects on the animal, as well as the disease, are being assessed under our local conditions, especially at Kariangwe where the incidence of natural infection is high.

With modern drugs, unless serious resistance develops, mortality from trypanosomiasis can be satisfactorily, though not necessarily economically, controlled. As with other diseases which are transmitted not by contact but by a vector the ultimate solution lies in the control or elimniation of the vector. In trypanosomiasis there must be no let up in efforts to check the tsetse fly advance and to bring about eventual elimination. Methods of doing so are known and would be quite applicable on a small scale, but where extensive areas are involved, as is the case in Southern Rhodesia, their cost of application is prohibitive. It is essential, therefore, to continue local investigations with the object of applying measures or combinations of measures, within the economic resources of the country, to bring about control where it is most urgently required.

Rabies

The slight reduction in the number of confirmed cases this year compared with last year is insignificant. Control measures, which to a large extent are based on vaccination of dogs, are certainly keeping the disease within reasonable limits but it is obvious that we will have to contend with it for many years to come.

Breakthrough of infection in vaccinated dogs has caused some misgivings for a number of years. In the early stages of the campaign such failures were attributed on conjecture and without evidence to a variety of factors such as non-viable vaccine, faulty administration, etc. Closer attention to detail has, however, to a large extent eliminated these correctable factors, but nevertheless three vaccinated dogs have died from rabies during the year, notwithstanding the fact that they were vaccinated as correctly as can be ensured.

Steps have therefore been taken to attempt to find a valid explanation for such breakthroughs. Samples of vaccine stocks from three districts and samples of virus recovered from natural cases of the disease have been submitted to the Lederle Laboratories in America for detailed examination. The results of their investigations are still awaited. It may simply be that the individual animals which the vaccine failed to protect were individually incapable of establishing an immunity—such a phenomenon is well known with many virus diseases.

Tuberculosis

It is gratifying to record appreciable progress in the campaign against this disease. The voluntary eradication scheme, with compensation for reactors

destroyed if these amount to more than five per cent. of the herd, is growing steadily and it can be stated conservatively that over half of the dairy cattle population is now T.B. tested. Certain individual dairymen are still very reluctant to participate in the scheme for fear that their financial losses will be too great should anything but a very low incidence of infection be disclosed. Fortunately high incidence is exceptional, but in one valuable herd, tested for the first time, 76 per cent. reacted. In view of the certainty that many of the non-reactors would subsequently become reactors, it was decided to slaughter the entire herd. That this decision was wise was amply proved when infection was found at slaughter in 11 of the 40 non-reactors. In this particular herd 28 carcases were condemned for human consumption on account of generalized tuberculosis. It is not difficult to imagine what harm would have resulted had this herd been dispersed before infection was detected. Another herd, not under test, was sold and stock found their way into various other and widely disseminated herds. Having found that a high proportion of cattle from this farm proved to be infected when herds into which they had gone came under test, every effort was made to persuade the owners of other similar herds into which these cattle had been introduced to join the eradication scheme. This has resulted in many more reactors, obviously infected before dispersal, being found and destroyed.

Infertility Conditions

Two diseases affecting breeding are scheduled, viz. contagious abortion and "epi-vag" (contagious epididymitis of bulls and contagious vaginitis of cows). The former is readily, economically and efficiently controllable by vaccination and its eventual complete control and eradication could be brought about by the stock-owners themselves if only they would make full use of the vaccine.

Compulsory vaccination has been considered, but there are so many administrative difficulties that it has been decided to leave it on a voluntary basis. It is extraordinary that so many individual stock-owners who have at their disposal easy and cheap means of preventing stock losses fail to make use of them. Notable examples are the failure to protect calves against quarter evil at a cost of 3d. per dose for vaccine, and to control contagious abortion with vaccine at 4d. per dose.

With "epi-vag" the position is very different. In the first place accurate diagnosis is difficult and requires clinical examination by a veterinary surgeon. When a diagnosis is established quarantine and general control measures can be applied, but it is extremely difficult to reach a definite decision that infection no longer exists, thereby enabling quarantine to be lifted. Secondly, no reliable method of treatment is known, nor is there any method of conferring immunity by vaccination. Fortunately epi-vag does appear to be a self limiting disease which eventually clears up, at least to the extent of not exerting any apparent harmful effects. The overall incidence of the disease has dropped and there has been a considerable reduction in the number of herds in quarantine.

Vibriosis, another infertility disease, has been found to be fairly widespread. It is impossible to state whether infection is in fact on the increase or whether our finding it is the result of improved techniques of diagnosis—probably both. Treatment with antibiotics is reasonably effective, especially in the female, but is costly to apply on any considerable scale. Prevention is readily achieved by breeding only by artificial insemination, as the disease is a strictly venereal one spread at coitus. Absolute control can be accomplished by artificial insemination and this is the method generally practised in those countries where the density of cow population is such as to permit of adequate artificial insemination cover. Southern Rhodesia is not yet at the stage where natural breeding can be largely replaced by artificial insemination. Individual herds are known in which the disease is obviously of serious economic importance but it is not possible as yet to assess its importance over the country as a whole. This disease is also fortunately self-eliminating, i.e. an animal may contract infection at service, fail to conceive or abort, but can be expected after some months to commence breeding normally again. The most serious effects are therefore noticed in the heifers which are bred for the first time to an infected sire.

Other factors, not associated with disease as such, are believed to play an even greater part in the low reproduction rate in stock, e.g. nutrition and management, mineral and vitamin deficiencies. Investigations into these aspects are proceeding.

Ticks and Tickborne Diseases

Although outbreaks of tickborne diseases over which the Department exercises control have been fewer in number, and losses in them less, tick control leaves a

lot to be desired. Some evidence of resistance of the blue tick to acaricides has been noted in comparatively limited areas, but it can be stated with absolute confidence that by correct dipping or spraying with selected acaricides these ticks can be efficiently controlled. The difficulty lies in getting stock-owners to practise regular, efficient dipping in correct strength dip washes.

The modern organic synthetic acaricides undoubtedly have their place and can play an extremely valuable part in controlling ticks and the diseases which they transmit. It is, however, essential that they be properly used and at correct strength. Not one of them can be as readily or accurately tested for strength as arsenic and most of them cannot be tested at all under field conditions. Generally speaking they are expensive, certainly much more so than arsenic, with the result that it is all too common for stock-owners to economize, and use them at ineffective strength which eventually results in the ticks developing a resistance against them. More and more of these dips are coming on to the market and high pressure salesmanship succeeds in getting people to use them. All dips have to be registered and as a result of past experience we are becoming more and more insistent that in dip tanks they be used only in conjunction with arsenic.

It is of interest to note that as a result of departmental encouragement, and where necessary pressure, to concentrate on tick control, properties which have over a period of years suffered outbreaks of theileriosis annually have either completely escaped infection or have suffered only negligible losses.

This is another example which goes to show that stock-owners so often have nobody but themselves to blame for their losses. The weapons are available, but they must be used and used properly.

Agalactia in Pigs

A full survey was conducted in all veterinary districts to determine to what extent pig producers were suffering economically from conditions affecting the milk supply of breeding sows or survival and growth of piglets. This showed that, whereas in former years trouble had been widespread and serious, it had dwindled to insignificant proportions.

Feeding experiments were conducted and these proved conclusively that the type of agalactia (mammary hypoplasia) which caused such serious losses over the period 1953-56 was due to the feeding of rations containing munga which was infected with ergot. Agalactia resulting from infection of the uterus and udder by bacteria, particularly of the B coli type, appears also have have diminished greatly but investigations, especially associated with vaccination, are continuing.

Parasitology

An additional veterinary officer was appointed to the research staff and has been engaged on parasitological investigations. The problem of internal parasites in cattle and sheep has long been recognized as a very important one. With the great development that is taking place in establishing irrigated pastures, particularly for sheep production, the problem will assume even greater proportions as such pastures provide ideal conditions for worm life. Experiments are in progress to determine the best system of parasite control under such conditions.

Much valuable work has been done by the District Veterniary Officer, Gwelo in the sheep raising parts of his district in stimulating owners to exercise control of parasites and practising the best methods of husbandry.

The Department has co-operated closely with the Natural Resources Board and I.C.A.s and the (Bilharzia) Research Laboratory in the combined campaign against the snail vectors of Bilharzia and liver fluke.

Conferences

The Director represented the Federation at the seventh annual session of the Council of Management of the Interafrican Bureau of Epizootic Diseases, the fifth annual meeting of the Interafrican Adivsory Committee for Epizootic Diseases, and the Symposium on Animal Trypanosomiasis, all of which were held in Luanda in July. He and the Assistant Director (Field) represented Southern Rhodesia at the meeting of the Interterritorial Foot and Mouth Disease Committee in Bulawayo in April. The Director had consultations with the Director of Veterinary Services, Mozambique, in Lourenco Marques, at which satisfactory arrangements were made to ensure that tobacco from the Federation would not be prohibited movement through Mozambique on account of Foot and Mouth Disease.

Acknowledgements

The high standard of efficiency with which the staff carried out their duties, often under extremely difficult conditions, is acknowledged with appreciation. To the various Government Departments whose co-operation and assistance has been of the utmost value thanks are extended.

Special acknowledgement is made of the valuable assistance rendered by the Central African Command, who operated the military cordon which so successfully contained the Foot and Mouth disease outbreak in the Wankie area during the last months of 1957.

D. A. LAWRENCE,

Director of Veterinary Services.

REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (FIELD) FOR THE YEAR ENDING 30th SEPTEMBER, 1958

Assistant Director of Veterinary Services (Field): Mr. J. MacKinnon.

Senior District Veterinary Officers: Messrs. T. Lees May, J. M. Williamson.

District Veterinary Officers: Messrs. H. M. Hodkin, J. Ross, A. E. Gillespie, A. D. Hurrell, J. E. Robinson, W. P. Boyt.

Senior Veterinary Trypanosomiasis Officer: Mr. R. W. Bryson.

Senior Government Veterinary Officers: Messrs. A. Wilson, J. L. M. McCulloch, W. A. Mundy, J. D. Adamson, V. A. D. Browne, R. S. Dugdale.

Government Veterinary Officers: Messrs: J. A. Lawrence, T. T. McNaught, A. J. E. Needham, I. A. Walker, J. J. Jackson, G. H. Stewart, R. L. McKenzie, A. C. Harkness, C. S. M. Kilroy, J. W. Thompson, J. T. R. Robinson.

The Field Establishment of 29 professional officers had only two vacancies at the end of the year. One of these posts is committed and will be filled early in the coming year. All vacancies could have easily been filled but it was resolved to reserve the vacancies for young Rhodesians who were in the process of qualifying, either in South Africa or the United Kingdom.

During the year three further substations were created, being Enkeldoorn, Que Que and Bindura. It was hoped that a professional officer would be stationed at Wankie, but unfortunately the housing shortage proved unsurmountable.

At present professional services by Government officials are available at 12 centres, namely Bulawayo, Salisbury, Gwelo, Fort Victoria, Chipinga, Gwanda, Sinoia, Umtali, Plumtree, Que Que, Bindura and Enkeldoorn.

New Appointments: Messrs. G. H. Stewart on 5.10.57. R. L. McKenzie on 9.11.57. A. C. Harkness on 7.11.57. C. S. M. Kilroy on 17.11.57. J. T. R. Robinson on 1.8.58. J. W. Thomson on 27.9.58.

Resignations: Messrs. E. V. Cock on 31.10.57. P. J. Hannan on 30.4.58. H. R. Thorogood on 30.6.58.

Messrs. Cock and Thorogood are in private practice in Salisbury, and Mr. Hannan in Umtali.

There are a total of 26 Veterinary Surgeons in private practice in Southern Rhodesia. Unfortunately most of them are in the larger centres such as Salisbury with 11 and Bulawayo with five, which bears out the contention that small animal practice is more lucrative and congenial than country practice.

Animal Health Inspectors. The approved establishment is 78 made up of eight supervisory inspectors and 70 A.H.I.s.

The year began with three vacancies and ended with a shortfall of four.

New Appointments	15
Superannuation	1
Resignation	11
Transfers	2
Deaths	1
Discharges	1

It is extremely disappointing to record this high wastage of lay staff.

A great deal of time and effort is expended in the training of recruits and when trained the more promising of them are lured away, mostly to farming and ranching where prospects appear better and conditions in general more congenial.

It would appear that one of the biggest snags is the constant camping. Normal patrols are from Monday to Friday, making camp in a new spot each night in all weathers. Again outbreaks of disease necessitate men living away from their families for two to three months at a stretch.

Meat Inspection. The Department is only responsible for the inspection of meat at the Cold Storage Commission Abattoirs at Bulawayo, Fort Victoria, Umtali, Salisbury and at Liebigs Factory, West Nicholson.

Meat inspection elsewhere in the country is the responsibility of the Department of Health and local Municipal Authorities.

The approved establishment for this very important duty is 15, but unfortunately there was one vacancy for the greater part of the year. Efforts have

been made to fill this vacancy with no success. Salaries for qualified technical officers of this nature have been vastly improved, both in the United Kingdom and the Union of South Africa, from which countries recruits are normally derived.

Clerical Staff. The approved establishment is 15: of these four are established officers, the remainder being temporary employees.

Accommodation. It is pleasing to report that the construction of a house at Enkeldoorn was completed during the year, and one is in the course of erection at Inyanga. When completed the Department will have some 33 houses, this is less than half our requirements.

The Plumtree quarantine station was brought into use on the 18th September, 1958.

Transport. With the exception of the two latest recruits all professional officers now use their private vehicles on official duties and 80 per cent. of the lay staff operated in a similar manner. The use of private vehicles on Government duties has proved a success. Professional officers are allowed to use any type of vehicle of 16 h.p. or over, but lay staff are required to use load carriers or four wheel drive vehicles.

A total of 53 man days was lost through vehicle deficiencies as compared to 93 in 1957 and 160 in 1956.

General

Climate, Food and Water Supplies, and the Condition of Livestock. Early rains fell in October of 1957 to be followed by an extended dry spell and then heavy falls in January. As a result crops suffered initially from scorching and subsequently from water-logging. Grazing was similarly affected, resulting in a low standard of finish on beef animals in all areas except the Gwanda low veld, where adequate browse was available. In addition many ranches are now overstocked as a result of previous good seasons and are carrying an excess of lower grade animals for which there is no ready market at the moment. However, where supplementary feedstuffs have been made available, stock have wintered reasonably well. Urea is being more widely used as a protein supplement and gives promising results so long as the food is well mixed to avoid the risk of urea poisoning, and so long as the urea is not required to replace more than 50 per cent. of the protein fraction of the diet.

During 1958 veld fires fortunately did not extract their usual toll in the lowveld ranching areas of the south west, but central and northern Matabeleland suffered severe burns and in the north east fires fanned by strong winds burnt large areas and destroyed stocks of winter fodder. Water supplies in general proved adequate this year and the situation in ranching areas has improved as a result of the greater attention being paid to the provision of an adequate number of watering points.

Dairy cattle on farms with adequate supplies of winter feed did well and dairy farmers produced a surplus of fresh milk and it is most gratifying that the measures adopted by this Department, aimed at the prevention and elimination of bovine infertility, should have been able so tangibly to assist the progress of the Dairy Industry.

An increasing interest in sheep husbandry has become manifest, although few carcases are as yet up to the quality of imported New Zealand mutton. Internal parasites continue to take their toll. Slaughter figures reveal that a large number of pigs are being sent in to market, although reports indicate that this is not a popular industry with farmers at the moment. The resolution during the year of the "agalactia" controversy may result in an increased interest being shown in pig production.

In the field of poultry husbandry, the economic importance of the casual flock appears to be decreasing, and the best profits are being made by the sale of day old chicks and by broiler production at well organized poultry farms.

Tick Life. A mild winter favoured the survival of all species, and the year produced a number of problems relating to the control of these parasites, many of these problems arising as a result of the failure to appreciate the strength and limitations of the organic acaricides. Two field trials were conducted during the year, one at Chipinga and the other in the Gwanda District.

1. Chipinga. It has always been considered that the presence or absence of the common Blue Tick (Boophilus sp.) served to supply an indication of the efficiency of the dipping procedures adopted. Being a host tick it is also the species

most likely to develop a genetic resistance to arsenical dip wash. In this experiment, allegedly resistant Blue ticks were sown on to a pasture on a Government farm, and a Friesian herd and a ranch herd were grazed thereon. During the third year the Friesian herd was showing evidence of tick infestation whilst on seven day dipping. This infestation was controlled, however, when the dipping interval was decreased to five days. When dipping reverted to seven day intervals, the tick population once again increased. The ranch herd during this time was not nearly so heavily infested. These ticks were successfully eliminated with D.D.T. at the end of the experiment.

The conclusion reached is that the Blue tick is now, in certain areas, and on certain farms, slightly more difficult to control than heretofore, but the suggestion that it might be uncontrollable is not acceptable.

2. Gwanda. Four tanks were charged, through the courtesy and with the co-operation of a commercial firm, with (a) Toxaphene, (b) D.D.T. and arsenic, (c) B.H.C. and (d) D.D.T. and Toxaphene. One tank, charged with arsenic alone, served as a control. It was found that providing regular dipping with proper supervision was carried out, a most satisfactory measure of control was achieved at each of the dip tanks. Toxaphene was confirmed as being the most effective agent for use against the Bont tick (Hyalomma species). B.H.C. showed itself to be a useful general purpose acaricide when freshly prepared but suffered from a marked susceptibility to the effects of dirt and contamination. The most interesting point, however, was the control achieved at the tank containing arsenic alone when coupled with proper supervision.

The position now would seem to be that the Bont tick, which was always regarded as being so very difficult to control, can be controlled. Indeed steps have been taken to cancel the Scheduled Heartwater Areas wherein a quite unwarranted degree of legal protection is afforded to the Bont tick.

The Blue tick will now require much more careful attention, but provided that dipping is regularly undertaken with adequate supervision to ensure the use of the correct strength of dip wash and the full production of cattle, it is not considered that the control of the Blue tick is an unsurmountable problem.

The organic acaricides have a definite part to play in the campaign against ticks, but compared to arsenical solutions they possess three disadvantages which should be considered in order to ensure that the best use is made of these agents.

1. They are very specific and selective in their action.
2. They are readily blocked by dirt in the diptanks.
3. Whilst there is a field test to determine the strength of Toxaphene, there is no field test for any of the other compounds. Even this test for Toxaphene is not relatively as accurate as the routine test employed to determine the strength of arsenical solutions.

Quarantine Notices: Bulawayo 294, Salisbury 263, Fort Victoria 34, Gwelo 358, Umtali 54, Chipinga 89, Sinoia 96, Gwanda 86. Total 1,274.

Contraventions: Cattle Cleansing Act—Bulawayo 400, Salisbury 52, Fort Victoria 209, Gwelo 38, Umtali 105, Chipinga 37, Sinoia 8, Gwanda 125. Total 974.

Animals Diseases Act—Bulawayo 218, Salisbury 74, Fort Victoria 35, Gwelo 525, Umtali 151, Chipinga 10, Sinoia 2, Gwanda 104. Total 1,119.

Livestock Inspections: The total number of inspections of cattle made by members of staff during the year, under the Cattle Cleansing Act and the Animals Diseases Act, was 16,029,370.

SCHEDULED DISEASES

Viral and Rickettsial Diseases

Foot and Mouth Disease. The year opened with Foot and Mouth disease present in the Southern portion of the Gwaai Reserve, Nyamandhlovu Native District and the northern section of the Nata Reserve (contiguous areas) Bulalima-Mangwe Native District with a spread into the Umgusa Forest Area, Nyamandhlovu Native District. As a result of the lack of dipping facilities in the latter area spread of infection to neighbouring farms was rapid owing to the long trips for dipping purposes. It was found necessary, although infection was only detected on five properties, to inoculate the cattle on 13 farms, involving in all 5,326 native and 646 European cattle.

Reaction to the inoculation with field virus was completely satisfactory. The cordon in this area was operated and controlled by the B.S.A. Police; it was backed by lay staff of this Department and proved satisfactory.

With regard to the Nata cordon which operated at the same time it was found necessary, as a result of intimidation of the native cordon personnel, to replace the Police cordon with the 2nd Battalion K.A.R. on the 4th October, 1957. This cordon proved highly successful and no further spread of the disease occurred. It was lifted on the last day of November.

In this outbreak, which was carried over from the previous year, a total of 94,463 head of cattle were inoculated, the virus having typed throughout as SAT I.

A considerable pig and goat population existed on the Nata River and although cattle on either side were virused, repeated inspection of pigs and goats failed to reveal infection in these animals.

On the 4th October, 1957, infection was detected on Limburgia Ranch situated in the Nuanetsi Native District and seven days later on the adjacent property—Rinette. Police cordons were in situ by the 12th October and inoculation of Limburgia cattle undertaken on the 15th. On account of a severe outbreak of malignant catarrh on Rinette virusing was not undertaken until the 21st October. In all 1,629 head were treated and reacted lightly. The virus was typed as SAT I.

It is interesting to record that an outbreak of the disease occurred during July, 1957, on the Nuanetsi River some 70 miles south east. The virus in that instance typed as SAT II, clinical manifestations being severe, and yet the outbreak on Limburgia and Rinette which typed as SAT I was of a benign nature with little evidence of slippering.

In the Wankie Native District the disease was diagnosed on the farm Westwood on the 14th March, 1958. The farm lies on the south bank of the Zambezi River. This and the adjoining property Paradise form an isolated unit in heavy game country. The cattle on both properties, 1,068 head, were inoculated with field virus on the 25th March with completely satisfactory reactions. Owing to the isolated nature of the farms Police cordons were not employed. Department cattle guards were put in charge of the cattle with a European member of the staff in control. Kudu in the vicinity of these farms were shot showing acute lesions. The virus typed as SAT II.

In the same district, 100 miles south-east of Westwood, infection was detected at Sialwindi Dip in Wankie Native Reserve Additional Area A, on the 26th August, 1958.

Following upon strategic withdrawals of cattle a Police Cordon was placed and 9,885 head of cattle were treated with field virus by the 18th September, 1958. Reactions to inoculation were very satisfactory.

The virus typed out as SAT I by the Pirbright Institute.

All the outbreaks originated in country heavily populated with game. It is interesting to record that in the Nuanetsi Native District the first outbreak was caused by the SAT II virus whereas the second, occurring three months later, was due to SAT I. Similarly in the Wankie Native District the March outbreak and the August outbreak were attributed to SAT II and SAT I respectively.

To find different viruses setting up disease in cattle in proximity to one another certainly leads to speculation.

Rabies. The following cases were confirmed during the year:—

Native District	*Number of Cases*	*Date of Last Case*	*Species*
Beitbridge	—	—	—
Belingwe	—	—	—
Bikita	—	—	—
Bindura	—	—	—
Binga	1	30.9.58	dog N.V.
Bubi	—	—	—
Buhera	1	7.1.58	human (African child not treated)
Bulalima/Mangwe	4	4.9.58	4 dogs N.V.
Bulawayo	—	—	—
Charter	—	—	—
Chibi	—	—	—
Chilimanzi	—	—	—
Chipinga	6	3.9.58	6 dogs N.V.
Darwin	—	—	—
Gatooma	—	—	—
Gokwe	—	—	—

Native District	*Number of Cases*	*Date of Last Case*	*Species*
Goromonzi	1	13.2.58	jackal
Gutu	—	—	—
Gwanda	—	—	—
Gwelo	—	—	—
Hartley	—	—	—
Insiza	—	—	—
Inyanga	—	—	—
Kariba	—	—	—
Lomagundi	—	—	—
Lupane	—	—	—
Makoni	—	—	—
Marandellas	2	11.9.58	1 dog N.V. 1 jackal
Matobo	—	—	—
Mazoe	—	—	—
Melsetter	8	19.8.58	5 dogs N.V., 2 dogs vac., 1 jackal
Mrewa	2	9.9.58	2 dogs N.V.
Mtoko	—	—	—
Ndanga	—	—	—
Nkai	—	—	—
Nuanetsi	—	—	—
Nyamandhlovu	—	—	—
Que Que	—	—	—
Salisbury	3	1.8.58	3 jackals
Selukwe	—	—	—
Shabani	—	—	—
Shamva	1	3.4.58	1 dog N.V.
Sipolilo	—	—	—
Umtali	12	16.9.58	10 dogs N.V., 1 dog vac., 1 human (received full course of treatment)
Umzingwane	—	—	—
Urungwe	—	—	—
Victoria	—	—	—
Wankie	—	—	—
Wedza	—	—	—
			41

Results according to Species. One hundred and sixty-nine specimens were examined by the Laboratory during the year.

The positive cases were as follows:—

Dogs	33
Jackals	6
Humans	2
	41

This brings the total number of positive cases confirmed since the first outbreak in 1950 up to 865.

Three of this year's canine cases occurred in vaccinated dogs. One dog had been vaccinated more than for years previously so that the immunity would have had every chance to wane. The second dog had been vaccinated as a pup, but had not been vaccinated as an adult. The third dog, however, had been vaccinated twice. As indicated in last year's report, some individuals are incapable of developing an immune response to vaccination, but such failures do not detract from the value of the Lederle Flury strain vaccine if a sufficiently high level of cover in the canine population can be achieved and if the campaign is backed by adequate control and police measures. The total number of proven cases in vaccinated dogs is now 119, but it is interesting to note that most of these developed in the early days of the campaign and only 18 breakdowns have occurred during the past four years. The success of our efforts can be gauged by the decline in number of the proven positive cases from 183 in 1954 to 50 in 1957. However there has been relatively little change during the current year, with the confirmation of 41 cases. This interpreted as indicating that the internal state of infection has been very largely brought under control, but that our present efforts can do no more than hold the position in the face of re-infection from the neighbouring Territories. For example, the outbreak raging in the Chipinga district came after three years' freedom from the disease. Rabies is prevalent in the Bechuanaland Protectorate and cases continue to occur in Bulalima-Mangwe. A rabid dog appeared at Kariangwe, consequent upon the Batonka's habit of drawing unvaccinated replacements from across the Zambezi for dogs killed by Trypanosomiasis. To illustrate this point a glance at the schedule given above will show that a total of 31 cases occurred in the districts on the borders of the colony, viz. Binga one, Bulalima-Mangwe four, Chipinga six, Melsetter eight, Umtali 12.

In other words 75.6 per cent. of the cases confirmed appear to have been the result of re-introduction of the disease. Internal districts like Sinoia, Gwelo, Que Que and Gwanda have been free of disease. With one notable exception rabies has not established a foothold inside Rhodesia. This notable exception is the Salisbury district and that portion of Mashonaland extending from Salisbury down to the Eastern border. Here the disease has become established in jackals and three cases have occurred within ten miles of Salisbury City centre. Fortunately a high level of vaccination cover has been achieved in dogs in and around the Capital City and the disease has not broken through into dogs. To assist in measures to eliminate the infection, the appropriate Department was approached with a view to declaring jackals "vermin" in these areas. The bounty payable on vermin would then encourage the hunting and destruction of jackals. I regret to have to report however, that even after 12 months of negotiation it was not possible to obtain this declaration in respect of these animals. The last jackal case occurred as recently as August of this year.

It is believed that part of the current failure to eliminate rabies completely has been the very success of our campaign to reduce the incidence of the disease. Few dog-owners actually see rabid dogs and fewer still have seen a human dying in the hopeless delirium of this fatal and horrible contagion. Indeed two humans were proved by laboratory examination to have died of rabies this year. One case received no medical treatment, but the other received the full course of Pasteur vaccine.

Large sections of the population, both Europan and African seem to require the goad of legal proceedings before their dogs are produced for vaccination. In this connexion I regret to have to report that in some areas we have not received as much assistance from officials in other departments as we would like, and as is necessary, in order to speed up the elimination of non-vaccinated dogs and to achieve the eventual conquest of rabies in Southern Rhodesia.

Our present system of prophylactic vaccination was adopted in the early days of the present outbreak when the Flury strain of vaccine became available because this product offered hope that we would be able to control the outbreak without recourse to protracted muzzling and tie-up orders and the destruction of thousands of dogs. At the moment tie-up orders are imposed only in the face of persistent active infection. However, unless we can achieve a high level of vaccine cover and receive full assistance from the Government officials who are "ex officio" rabies officers, the disease can easily flare up once again to the proportions it achieved four to five years ago.

During the year, 1,396 unvaccinated dogs were destroyed and 895 persons of all races prosecuted for not complying with the Rabies Regulations. Most of these offences were in connexion with the failure to vaccinate.

A total of 135,357 dogs was vaccinated during the year, bringing the total number of inoculations with Lederle's Flury strain of vaccine administered since July 1951 up to 838,219.

Contagious Epididymitis and Vaginitis. It is pleasing to record that only two properties have been placed in quarantine on account of Contagious Epididymitis and Vaginitis during this year. The position on these new foci of infection is complicated by the detection of vibrio foetus and brucellosis in the cows.

At the end of last year there were in all 92 premises in quarantine and this year it is very gratifying to record that only 50 are at present under restrictions.

Over the last three years a gradual though unspectacular improvement has been recorded in the over all position on infected properties. It has been possible to devote more of our professional officers' time to cattle on infected properties and thus to encourage the removal of non breeders and the chronically infected animals. At the same time the closed herd policy has been advocated and this no doubt has contributed materially to a reduction of further spreads.

During the year the use of artificial insemination on dairy stock on infected premises within a radius of 30 miles of Bulawayo, Gwelo and Salisbury continued, with Government paying transport costs and the owner paying 15s. per insemination.

The greater use of artificial insemination in both infected and clean herds has also considerably contributed to the improved condition.

In the past it was Government policy to compensate stockowners whose breeding stock, on slaughter, were condemned for human consumption on account of this disease. This policy has now been altered in that only dairy stock and

bulls of all breeds culled by professional officers of the Department are eligible for compensation on condemnation.

At the beginning of the year Professor N. O. Rasbech, an International authority on infertility of stock, paid a second visit to the country under the auspices of the F.A.O. His report has been released.

Lumpy Skin Disease. This condition gave little trouble. Few cases were recorded and the disease was, on the whole, of a mild sporadic nature. Only two properties were placed in quarantine.

Heartwater. It is impossible to assess the mortality from this condition. In the Victoria Veterinary district mortality of 46 head of cattle on four premises was confirmed.

In the Salisbury district five valuable Ayreshire cows succumbed. The vector does not survive on the Rhodesian highveld and it is presumed that ticks were brought on to the farm by a mob of some 250 graziers which were railed from Bulawayo.

It is reported that mortality was recorded from a total of 50 properties elsewhere in the country but this was not confirmed.

During the year a questionnaire was forwarded to all ranchers in the known heartwater areas with regard to vaccine production. Judging from the tardy replies, ranchers consider that one to two per cent. calf mortality is a usual occurrence. Few were interested in vaccination owing to the short life of the vaccine and the necessity for controlled calving.

A large ranch in the Gwanda district discontinued annual calfhood vaccination owing to cost and the fact that by the intelligent use of the modern organic acaricides mortality can be reduced to a very low level.

Bacterial Diseases

Anthrax. This disease was confirmed in cattle in the Nkai Native Reserve during October, 1957, and in the Silobela Native Purchase Area in June of this year.

Investigations revealed that in the Nkai Reserve deaths began in May, 1957 but were not reported, as they were attributed to poisoning. It is contended that in all some 155 head of cattle, 50 sheep and goats, four donkeys and two pigs succumbed. A total of 59,116 head of cattle, 16,091 sheep and goats, 3,223 donkeys, 15 mules and 4,410 pigs were inoculated with Anthrax vaccine, and it was necessary to destroy by burning 639 hides and one hide shed. Four human malignant pustule cases were traced but no human mortality occurred.

In the Silobela Native Purchase Area it is estimated that 80 head of cattle died before the disease was confirmed. One human case with typical skin lesions was successfully treated. Twenty-five thousand nine hundred and two cattle and 6,458 sheep and goats were vaccinated. Owing to the proximity of Jombe Crown Lands to the outbreak and the fact that illegal movement of cattle occurred between Jombe and Silobela, an additional 10,832 cattle and 1,359 sheep and goats were vaccinated on the Jombe Crown Lands.

One death occurred on a farm in the Gwelo district necessitating the vaccination of 11,955 cattle and 650 sheep on the infected and adjacent properties.

During April, one case was confirmed in a cow on a plot in the Bulawayo district and 269 cattle on the infected and adjacent properties were vaccinated.

In the Victoria Native Reserve 20 head of cattle died from Anthrax. Here a total of 39,293 cattle and 720 sheep and goats were inoculated on the infected and adjacent properties.

The overall mortality figure is given as 313 and a total of 180,293 head of stock was inoculated with anthrax vaccine.

Tuberculosis.

A. Imports: Total tested 1,689. Reactors 1.

B. Exports: Total tested 796. Reactors 4.

C. Umtali Old Eradication Schemes A. and B.

Number of herds under test 7.

Number of cattle under test 880.

Number of reactors found during the year Nil.

D. OLD VOLUNTARY SCHEME —

Veterinary District	*Number of herds under test*	*Number of cattle under test*	*Number of reactors found during the year*
Salisbury	124	9,729	12
Bulawayo	68	5,895	7
Umtali	18	943	—
Gwelo	27	1,445	2
Chipinga	21	1,136	—
Sinoia	8	1,058	—
TOTAL	266	20,206	21

E. Compensation Scheme —

Veterinary District	*Number of herds under test*	*Number of cattle under test*	*Number of reactors found during the year*
Salisbury	91	7,742	203
Bulawayo	21	1,182	7
Umtali	30	3,018	17
Gwelo	9	740	1
Chipinga	8	923	—
Sinoia	3	120	—
TOTAL	162	13,725	228

F. VOLUNTARY SCHEME (Beef herds) —

Veterinary District	*Number of herds under test*	*Number of cattle under test*	*Number of reactors found during the year*
Salisbury	4	1,406	41

Total number of herds under test . . . 432
Total number of cattle under test . . . 35,337
Total number of reactors during the year . 284

The number of herds under test has increased by 63 and the number of cattle under test by 6,347 head. The compensation scheme has expanded satisfactorily, 162 herds being now under agreement as opposed to 91 at the end of last year, the majority of this increase having taken place in Mashonaland. It is estimated that two thirds of the dairy herds in Southern Rhodesia are now under test and a survey is being conducted by the Department to determine the exact number of herds which are still untested. The number of reactors has increased from 176 to 283 but 132 of these were in a herd of 172 head. In this case the entire herd was slaughtered and on post mortem examination 126 head showed visible lesions of tuberculosis. This was an exceptional case and the vast majority of herds tested were free from infection. The annual test on a large ranch in Matabeleland was again carried out. In previous years the test had been confined to breeding stock but this year all stock were included. Out of the 50,139 head tested there were 601 reactors (0.67 per cent.). An effort is being made to eliminate all reactors held in isolation and if in future it is possible to slaughter reactors immediately after test, final eradication will be in sight.

Meat Inspection Incidence.

	Bovine	*Porcine*
C.S.C., Salisbury	365	38
C.S.C., Bulawayo	6	136
C.S.C., Umtali	2	—
C.S.C., Fort Victoria	556	2
Liebigs West Nicholson	2	1

The majority of cases in the Salisbury C.S.C. were from the heavily infected dairy herd and the large ranch in Matabeleland which have been mentioned above. The cases at Fort Victoria, with the exception of two were also from this ranch.

It is of interest to note that of the 128 porcine heads condemned at Bulawayo, 114 were from African owned pigs. This may be due to human infection and steps are being taken to check by laboratory methods the type of organism involved.

Bovine Brucellosis (Contagious Abortion). Infection was confirmed on premises as under: Bulawayo 17, Salisbury 22, Gwelo 28, Fort Victoria two, Sinoia nine, Gwanda four. Total 82 premises.

Of 2,258 samples tested 295 proved positive.

During the last few years Departmental propaganda has been directed at the stock owner to make greater use of S19 vaccine. Unfortunately insufficient use is made of the vaccine, no doubt due to the fact that abortion storms have not occurred. The recommended practice is to vaccinate all heifer calves between the

ages of four to ten months (preferably six to eight months). The use of the vaccine in adult dairy cattle has at odd times led to a temporary drop in milk yield and skin sloughing at the site of injection.

Quarter Evil. Outbreaks were confirmed as follows:

Veterinary district	*Outbreaks*	*Deaths*
Bulawayo	35	556
Salisbury	31	184
Gwelo	11	17
Fort Victoria	5	17
Umtali	22	91
Chipinga	4	6
Sinoia	31	126
Gwanda	7	300
TOTAL	146	1,297

It can be argued that the above figures represent only a small portion of the actual mortality which has occurred. The Department produces and sells cheaply a vaccine and at the same time numerous useful vaccines can be purchased on the open market, yet this senseless loss is recorded year after year.

The farming community lay great stress on the need for further research into infertility and other problems, but it is considered that more enthusiasm on their part in adequately safeguarding their stock with available vaccines would go a long way towards a balanced farm economy.

Swine Erysipelas. Infection has been confirmed on four properties with little mortality.

Protozoal Diseases

Trypanosomiasis. The disease continued throughout the year to be one of considerable economic importance. The general position in the south eastern end of the country deteriorated sharply, involving the native districts of Bikita, Chipinga, Ndanga and Nuanetsi. In the north east infection broke out in the Darwin Native District and in the north west infection reappeared on a ranch which had previously been infected a few years ago.

The following table shows the number of smears taken, confirmed cases and treatments given in all infected native districts:—

District	*Smears*	*Positives*	*Inoculations*
Bikita	85	6	—
Binga	6,626	26	9,515
Chipinga	2,798	364	7,403
Darwin	323	22	294
Gokwe	2,942	36	10,380
Inyanga	1,162	18	4,186
Lupane	1,352	25	10,799
Mrewa	224	—	—
Mtoko	1,429	7	1,284
Ndanga	800	31	22,857
Nuanetsi	246	17	1,931
Urungwe	10,347	26	856
TOTAL	28,334	578	69,505

These figures show an increase of 352 blood smears, 156 positives and 7,944 treatments over the previous year.

In addition 1,309 donkeys were inoculated and a special treatment involving 898 inoculations with Ethidium Bromide was undertaken at Binga.

Positive smears were made up as follows:—

T. congolense 281.

T. vivax 273.

T. brucei 13.

Mixed infection 7.

Untyped 4.

The actual figures for mortality cannot be given but they are believed to be very low owing to the use of the various drugs now at our disposal.

The disease position in the various districts is given hereunder:—

Bikita Native District. Six cases were confirmed on two ranches, one of which became infected for the first time, the other having shown infection during 1956.

Binga Native District. The position here can be considered static, 26 cases being confirmed and successfully treated.

Chipinga Native District. In the European areas 184 cases were diagnosed on 29 different farms (1956-57 75 cases on 17 farms).

In African areas there were 181 cases diagnosed at ten centres. Of these 66 occurred at one centre—Dumisayi.

A marked increase in trypanosomiasis occurred as compared with the previous four years. Both European and Native areas were affected. These cases persisted even during the winter months on the higher altitude European farms. On some of these farms infection had not been confirmed for five years and even longer.

In the lower Sabi area regular block treatments at Mwangazi and Muumbe were suspended to assess the position and in fact those dips remained free of infection between September and May possibly due to residual Antrycide protection.

Regular treatment was maintained in Chisubanje cattle south of the Chawaeta gate. In the other Chisumbanje cattle only two cases were recorded towards the end of the year.

Cattle at Gwenzi were also treated regularly and remained free of infection.

It is reported that fly is advancing northwards from the lower Sabi Division and it is hoped that settlement of this area will take place next year to follow on the descriminative clearing which has been carried out.

Darwin Native District. Twenty-two cases at one centre. Eighteen others died before treatment was carried out.

Infection occurred at Chiswiti Reserve for the first time. The origin of infection (centre Kaitano) is obscure at the moment but seems more likely to have been either carried by fly or movement of an infected animal, possibly from Portuguese territory.

A careful watch is being kept both on Chiswiti and Mzarabani Reserves as extensive developments and settlements have been agreed to. Game appears to be plentiful again after the gap in the shooting campaign. No doubt the settlement will quickly dispose of the antelopes, but some 60 elephant also range between these Reserves and Portuguese East Africa, from where they could easily bring fly.

Discussions have been held with Portuguese veterinary authorities who are re-assuring as regards trypanosomiasis on their side of the border.

Gokwe Native District. There were 36 cases at 16 centres.

As with Binga the position remained static, certainly no improvement occurred although very few deaths did occur from trypanosomiasis except in areas cut off in the rains.

Six new centres of infection were found and of these five had never previously been infected. They lie in the Forest Area and to the north of the Siabuwa Road.

In view of past history it was considered advisable, when infection was first found in a centre on any scale, to block inoculate all cattle and follow this with a second block in two months time to cover the survival time of the supposed tsetse flies in the area; the protective period following this regime is probably about three months.

Areas which are cut off by rains in the Forest Area and to the north are to be the subject of a field trial of Prothidium and Antrycide R.F.

Inyanga Native District. Eighteen cases confirmed at three centres in Inyanga North Reserve.

The position remained unchanged during the year awith the enzootic area of Inyanga North Reserve again being infected. Two-monthly block inoculations are carried out at Fombe and Chimsasa although these were withheld for four months until infection again broke through.

An old centre, Chifambe, also became re-infected during the year.

There are plans to increase the cattle in Inyanga North and this has been agreed to.

Lupane Native District. There were 25 cases at six centres, one being an important new centre—Tjotjolo North on the Shangani.

The position remains similar to last year although the only centres on the Shangani infected were Tjotjolo North and Karna Block. Both of these are new centres although Karna Block was infected in 1952. Mechanical infection is suspected as being the origin in both cases.

Mrewa Native District. No cases at all during the year although regular inspections were carried out.

Mtoko Native District. There were seven cases at four centres, two of which occurred in Chikwizo Reserve and two in Mtoko Reserve.

Chikwizo Reserve was kept on two-monthly antrycide treatments. These were suspended for a time until infection broke through four months later. This block inoculation was completed in May and until 30th September, no further cases have occurred in the original Chikwizo cattle although infection did occur in freshly introduced stock after a month.

In Mtoko Reserve infection occurred on a small scale at two old centres Chingururu and Katsande. Inoculation, of infected kraals only, restored the position.

Ndanga Native District. Thirty-one cases confirmed from four centres. Thirty in African areas, one from a European ranch.

All cattle were inoculated bi-monthly in Ndanga East Reserve and no positive smears were recorded. Again to assess the position treatment was withheld for a period and as in other areas infection broke through at four months, at Muteyo. Rupangwano and Peri however remained free of infection.

The Muteyo infection coincided with new infection on the European ranch. This is the first Ndanga ranch to be infected.

Sangwe Reserve which was not under routine treatment was fairly heavily infected in March and a block treatment was carried out.

A new dip was opened in the south of the Sangwe Reserve; this will help to cut down mechanical transmission which must have occurred when all cattle dipped at one centre.

Nkai Native District. No infection occurred during the year.

Nuanetsi Native District. Seventeen cases confirmed at one centre in Matibi No. 2 Reserve—Chibgwedziwa Dip, which was infected for the first time. The cattle were severely infected clinically, all being T. vivax infections. Sixteen head had already died when infection was confirmed but there was a spectacular improvement after antrycide block treatment.

Urungwe Native District. Twenty-six confirmed cases from five centres, all European farms.

Sporadic outbreaks occurred in the Karoi farms particularly towards the north. The increased traffic, which is due to the Kariba project, has carried out a number of fly in spite of the use of flygates.

It was agreed to re-settle the eastern section of Urungwe Reserve with two herds of 200 head in fenced paddocks, but this has not yet been carried out. The move is eagerly awaited by the inhabitants, and it should be most interesting in that it is one of our first planned resettlement schemes in which newer drugs may have to play a part.

In the report for 1957 mention is made of the movement of cattle from the Zambezi basin to high ground and that within six weeks of the movement 40 per cent. of the cattle were found infected. In spite of medium fiy challenge the cattle have been maintained successfully on a drug regime of Antrycide D.M.S. every 30 days or Antrycide pro-salt every 60 days. In order to get a fair assessment each herd was divided into two and treatment faithfully undertaken.

The cost of maintaining the 740 head of cattle is given as £2,100 which is equivalent to £2 12s. 6d. per head. This figure includes salaries, transport, equipment and drugs.

A start was made in the Binga District to test the efficacy of trypanocidal drugs in the face of heavy tsetse challenge. The drugs under test are Antrycide revised formula, Prothidium, Berenil and Ethidium Bromide.

Piroplasmosis (Redwater). Confirmed cases were recorded as follows:—

Bulawayo 100, Salisbury 48, Fort Victoria 16, Gwelo 50, Umtali 19, Chipinga 98, Sinoia 12. Total 343.

This is almost double the figure for the previous year. This condition is well known to all stockmen who make full use of the revival remedies on the market, and treat their infected animals, making no report. Reports and requests for assistance are made when outbreaks occur which do not respond immediately to the usual treatment. Private practitioners have reported treating more cases than usual during this past year.

African Coast Fever (Theileria parva).—The last recorded outbreak of this disease occurred in the Chipinga Native District on the 10th March, 1954. By May of that year all the cattle on the infected property were slaughtered and the farm kept free of cattle for a full two years. Intensive supervision of cattle in the Chipinga and Melsetter Native Districts has been maintained to date with no evidence of infection detected.

Theileriosis (Gonderia lawrencei). Outbreaks were confirmed as follows:

Bulawayo four, deaths 37; Salisbury five, deaths; 63; Fort Victoria two, deaths 52; Umtali two, deaths 12; Sinoia eight, deaths 264; Gwanda one, deaths nine. Total outbreaks 22, with 437 deaths.

During the previous year 34 outbreaks occurred with 601 deaths. It is hoped that this improvement can be maintained in the coming year.

Quarantines and short interval dipping and hand-dressing continued to be the control measures adopted. To date no drug has proved of value in the treatment of cases.

In order to reduce tick life to a minimum on previously infected centres, five day interval dipping was instituted and close supervision maintained on cattle on these premises for the major portion of the compulsory dipping period, which extends from the 1st November to the 31st March each year.

Fungal Diseases

Cutaneous Streptothricosis (Senkobo Skin Disease). In the Lupane and Wankie Native Districts outbreaks of some severity were recorded with the destruction of 32 incurable cases. Isolated cases were also confirmed in the Binga, Gokwe and Que Que Native Districts. One case was confirmed in the Gwanda Native District.

Diseases Due to Mites

Sheep Scab. Only one mild outbreak was recorded.

SCHEDULED DISEASES OF POULTRY

Viral Diseases

Fowl Pox. Outbreaks are reported from all areas although mortality is usually not significant. Chipinga, however, suffered one outbreak with 100 per cent. mortality, and Bulawayo district was severely affected during February and March.

Newcastle Disease. There were no outbreaks of this disease during the year.

Bactrial and Spirochaetal Diseases

Fowl Cholera. A total of seven outbreaks was confirmed necessitating the destruction of 922 fowls, 50 ducks, 18 pigeons and 12 turkeys in order to prevent the spread of infection. Although this figure for birds destroyed is smaller than last year it does not necessarily represent a decrease in the incidence of this disease. At present whole flocks are slaughtered out when the disease is confirmed. Compensation is paid only in exceptional circumstances and as a result there may well be a tendency on the part of owners to conceal this disease.

Fowl Typhoid. A total of 21 outbreaks was confirmed, the disease being eliminated on infected properties by means of blood testing, the slaughter of reactors, and the disinfection of premises. In addition medication was employed in some flocks.

Bacillary White Diarrhoea. No outbreaks occurred. One hundred and twenty-three thousand seven hundred and ninety birds were blood tested on 163 premises. Last year 124,018 birds were tested and the year before the figure was 130,942.

Protozoal Diseases

Coccidiosis. This condition is common, particularly amongst young birds at four to six weeks of age whenever hygiene is faulty. The disease is usually recognised and treated by the owners, but does cause considerable loss to the poultry industry.

NON-SCHEDULED DISEASES

Ephemeral Fever. This condition was widespread during the period January/March, few deaths were reported.

Ophtalmia. All districts recorded a lower incidence of this condition. Stockowners, using organic acaricides in dip washes, consider that the incidence of the condition decreased from the time they started to use these preparations.

Vibrio Foetus. A large number of samples were submitted from suspected outbreaks. Thirteen properties were found to be infected. Most cases occurred in the Salisbury District, where the infection is believed to be widespread.

Paratyphoid. The disease was confirmed in calves on a number of premises, mostly in ranch herds where night kraaling is practised.

In one herd the disease was confirmed in two adult cattle. Calfhood vaccination was undertaken on infected premises but stock owners have not adopted maternal vaccination to any extent.

Coccidiosis in Cattle. A limited number of outbreaks were confirmed, mostly in bullocks shortly after being placed in pens for feeding. No mortality has been recorded.

Anaplasmosis. Cases have been confirmed as follows:—

Bulawayo 40, Salisbury 39, Fort Victoria 18, Gwelo 49, Umtali 19, Chipinga 63, Sinoia 16, Gwanda seven. Total 251.

This figure represents the confirmed cases only and is considered to represent only a fraction of the actual cases that must have occurred during the year. It is noted that the smallest veterinary district, Chipinga, has recorded most cases, viz., 63. In this area intensive supervision of dipping operations is carried out and stock are inspected frequently, therefore little can escape detection.

Myiasis. The incidence of this condition was low and this improvement has been attributed to the use of organic acaricides in dip washes.

Horsesickness. A total of 113 cases was confirmed but unfortunately the actual mortality cannot be given. It has been reported that mortality was unusually high. The freeze dried vaccine, at present on issue, is less popular with horse owners than the liquid vaccine previously used, no doubt due to the additional trouble in preparing it for injection and it is suspected that a greater number of animals than usual failed to be protected.

Equine Biliary Fever. In all 33 cases were confirmed in horses and donkeys.

Agalactia in Swine (Mammary hypoplasia). This condition gave little trouble during the year only three cases being confirmed; these were all found to be associated with parasitized grain.

During the year the department carried out a survey to investigate all aspects of milklessness in sows and associated piglet mortality. Some 380 producers were interviewed and it appeared that afebrile agalactia (Mammary hypoplasia) had been widespread throughout the Colony at one time but little if any trouble was being experienced at the present. It also appeared that this condition was invariably associated with the feeding of munga or its by-products. Feeding experiments showed conclusively that the condition was caused by the pregnant sows feeding on ergot contaminated munga.

The survey also showed that febrile agalactia or post parturient fever had caused considerable losses, but that the peak of infection had passed and few cases were now occurring.

Verminosis. Propaganda measures were continued during the year with an increasing tempo. The Natural Resources Board's propaganda was directed at the destruction of snails, the intermediate hosts of Bilharzia and Liver Fluke. All stockowners forwarding cattle for slaughter at the Cold Storage Commission abattoirs in this country are immediately notified of the liver condemnations on slaughter and are advised to consult our officers in regard to the control and eradication of this condition.

Internal parasites have assumed serious proportions on many farms and useful demonstrations were made to owners and at Farmers' Meetings to impress the advantages to be gained through regular treatment of infested stock.

Excellent work has been done in the Gwelo District by the Department to demonstrate the comparative ease with which sheep can be successfully reared with the worm burden kept at a minimum.

Stockowners are slowly becoming more parasite conscious, but the regular dosing of stock is still weighed against extra work with a minimal labour force and the high cost of drugs. Every possible endeavour has been and will continue to be made to induce stockowners to adopt a regular dosing schedule.

Aphosphorosis. During the previous year, aphosphorsis was detected in cattle in the Insiza and Nyamandhlovu Native Districts. A combined exercise with the Department of Conservation and Extension and the Chemistry Branch, in the Shangani watershed area proved the condition to be present on a large scale. For instance herbage samples fell from .114 per cent. Phosphorus dry matter to .077 per cent. and blood samples plummeted from 6 to 7 mg. per cent. to 2.76 mg. per cent. The condition was reported to be present in at least ten per cent of cows with calves at heel, and in two per cent. steers. It is clear that further investigation must be undertaken in other areas in order to assess the true position in the country as a whole.

Poisoning

Arsenic. Bulawayo 222, Salisbury 224, Fort Victoria 18, Gwelo 127, Umtali 127, Chipinga 11, Sinoia 107, Gwanda 45. Total 881.

These numerous deaths indicate extreme carelessness in the handling of arsenical dip wash. About 40 deaths are believed to be due to malicious intent.

Copper and Lead. Eleven deaths.

B.H.C., Toxaphene and D.D.T.: Forty deaths amongst cows, calves and dogs. D.D.T. was responsible for an outbreak of poultry mortality.

Anthelmintics: Sixty-five deaths due to incorrect dosing with Hexachlorethane and Tetrachloroethylene.

Fertilizer (Nitrate). Thirteen deaths.

Urea. Twenty-four deaths.

Veld. Five hundred and twenty-one deaths reported. M'Kosaan (Dichapetalum cymosum) is the greatest killer, being responsible for at least 319 deaths. Other plants incriminated have been Crotalaria, Lantana and Senecio species. Diplodia fungus has been responsible for at least 12 deaths.

ARTIFICIAL INSEMINATION

It was found possible during the year to start an Artificial Insemination subcentre at Gwelo, receiving regular supplies of semen from Salisbury.

There are now three centres in operation, namely Bulawayo, Gwelo and Salisbury. Only the centres at Bulawayo and Gwelo are dealt with in this report.

At Gwelo the service commenced on the 17th January and up to 30th September, only 347 inseminations were performed. It is thought, however, that as farmers dispose of their bulls and good results follow the use of Artificial Insemination more people will avail themselves of the service.

At Bulawayo, 819 inseminations were performed. It is clear that dairymen are swinging steadily round to this service. At present negotiations are in hand for the expansion of this service to at least 1,000 cows at a fixed charge per insemination.

Stockowners have always objected to the mileage charge of one shilling per mile as being much too high.

In conclusion I wish to express my thanks to the Staff of both Federal and Territorial Departments with whom the Department of Veterinary Services has worked closely during the year. I also wish to express my appreciation to all members of my staff, who have at all times given of their best during the past year.

STOCK SLAUGHTER FIGURES

	Cattle	*Pigs*	*Sheep and Goats*
Bulawayo C.S.C.	73,991	19,512	1,616
Salisbury C.S.C.	73,708	51,280	6,892
Fort Victoria C.S.C.	28,325	6,040	913
Umtali C.S.C.	9,134	11,932	1,955
Liebigs Factory, West Nicholson	166	288	—
	185,324	89,052	11,376

The corresponding figures for last year were cattle 164,746, pigs 69,998, sheep and goats 9,288.

From the beginning of May, 1958, slaughtering at Liebigs Factory caesed and meat was obtained from the Cold Storage Commission, Bulawayo, for processing.

CARCASE CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Bulawayo C.S.C.	1 350½	318½	1
Salisbury C.S.C.	618¼	60¼	14¼
Fort Victoria C.S.C.	694¼	44	—
Umtali C.S.C.	68	27	5
Liebigs Factory West, Nicholson	2	—	—
	2,733	449¾	20¼

MAIN REASONS FOR CONDEMNATION

	Cattle	*Pigs*	*Sheep and Goats*
Emaciation and oedema	1,815	7	6
"Measles" (Cysticercus bovis and C. cellulosae)	430	352	—
Pleurisy and Peritonitis	170¼	15¼	—
Tuberculosis	142¼	15¼	—
Sarcocysts	85	20	—
Bruising	61¾	4¼	—

Cattle from C.P.A. holding grounds in Matabeleland are mainly responsible for the large number of condemnations for oedema and emaciation. The incidence of "measles" indicates that a large number of humans in this country must be afflicted with either the "beef" or "pork" tapeworm

The high tuberculosis incidence results from the slaughter of reactors to the tuberculin test following a determined drive to clean up infection on a large ranching enterprise in the lowveld, and also from the heavily infected dairy herd discovered during the year.

CATTLE CENSUS AND DIPPING TANKS

	European	Native	Total	Dip Tanks	Spray Races
Bulawayo	380,739	381,722	762,461	961	64
Salisbury	314,520	311,317	625,837	1,339	332
Fort Victoria	184,519	446,466	630,985	599	30
Gwelo	278,350	247,466	525,816	899	23
Umtali	70,211	148,454	218,665	439	49
Chipinga	51,098	46,568	97,666	257	14
Sinoia	109,447	56,505	165,952	323	79
Gwanda	122,993	336,522	459,515	306	10
TOTAL	1,511,877	1,975,020	3,486,897	5,123	601

IMPORTATIONS

	South Africa	*United Kingdom*	*United States of America*	*Portuguese East Africa*	*Bechuanaland Protectorate*	*Northern Rhodesia*	*Total*
Bulls	350	4	—	—	—	1	355
Cows	318	—	—	—	—	—	318
Heifers	692	11	4	—	—	—	707
Calves	143	3	—	—	—	—	146
Mares	224	9	—	—	—	—	233
Stallions	51	—	—	—	—	—	51
Geldings	411	1	—	19	—	—	431
Mules	66	—	—	—	—	—	66
Donkeys	—	—	—	—	29	—	60
Pigs	18	—	—	—	332	1	351
Sheep	1,237	—	—	—	—	60	1,297
Goats	59	—	—	—	—	1	60
Slaughter Stock —							
Bulls	—	—	—	—	80	—	80
Cows	—	—	—	—	525	—	525
Oxen	—	—	—	—	1,182	—	1,182
Mixed	—	—	—	—	600	—	600
Pigs	—	—	—	—	834	226	1,060
Sheep	338	—	—	—	1,358	—	1,696
Goats	—	—	—	—	350	—	350
					TOTAL		9,536

Bovine: 3,913 Equine: 810 Porcine: 1,411 Ovine: 2,993 Caprine: 409

EXPORTATIONS

	Northern Rhodesia	Bechuanaland Protectorate	Belgian Congo	South Africa	Kenya	Nyasaland	Tanganyika	Portuguese East Africa	Total
Bulls	94	—	5	1	—	3	—	7	110
Cows	479	—	—	—	—	—	—	27	506
Heifers	532	—	—	1	—	43	—	—	576
Calves	92	—	—	—	—	6	—	3	101
Oxen	2,551	—	—	—	—	—	—	12	2,563
Mixed	480	—	—	—	—	—	—	—	480
Mares	8	—	—	11	—	1	—	—	20
Stallions	1	—	—	6	—	—	—	—	7
Geldings	23	—	—	12	—	6	—	7	48
Donkeys	89	—	52	135	—	—	—	—	276
Pigs	41	65	—	71	12	3	2	2	196
Sheep	535	—	—	—	—	—	—	—	535
Goats	165	—	—	—	—	—	—	—	165

Slaughter Stock to Northern Rhodesia —

Oxen	1,695	1,695
Cows	386	386
Calves	128	128
Mixed	2,676	2,676
Pigs	75	75
Sheep	1,260	1,260
Goats	240	240
TOTAL		12,043

Bovine: 9,221 Equine: 351 Porcine: 271 Ovine: 1,795 Caprine: 405

J. MacKINNON

Assistant Director of Veterinary Services (Field)

REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (RESEARCH) FOR THE YEAR ENDING 30th SEPTEMBER, 1958

Staff

The following is a list of staff as at the end of the report year:—

Assistant Director of Veterinary Services (Research): Mr. G. J. Christie.

Senior Veterinary Officer (S.P.O. II): Mr. D. K. Shone.

Government Veterinary Officers: Mr. R. M. Roberts; Mr. J. B. Condy; Mr. J. R. Philip (on secondment from Field Staff).

Chief Laboratory Assistant (S. & T. O. II): Mr. G. E. Wells.

Laboratory Technicians: Mr. D. B. Vickers; Mrs. F. M. Coates-Palgrave (temporary).

Lay Inseminators: Mr. R. A. W. Price; Mr. J. S. Ward; Mr. J. M. Selby (on secondment from Field Staff); Mr. O. Veldman (on secondment from Field Staff).

Station Superintendent: Mr. F. J. A. Waller.

Stockman (Gwebi Research Station): Mr. A. Craddock.

Administrative and Clerical Officer: Mr. C. P. Solms.

Clerical Officer (Typist): Mrs. E. H. Harrison.

Clerical Officer: Mrs. K. A. R. Glenister.

The addition of Mr. J. B. Condy, in November, 1957, to the post of parasitologist meant that only one of the six professional posts remained vacant.

The filling of this post has been an extremely welcome addition as it has widened the scope of our investigational work considerably. The extending interest in sheep production and the considerable acreages being put down to temporary pastures and to irrigation have resulted in increasing necessity for helminthological investigations.

Mr. Becks resigned in June of this year, leaving us with a staff of two permanent technical officers and one temporary, to service a professional staff of five.

As a result of re-organization it was found possible to provide five technical posts, of which only three are filled at present. It is considered, however, that this should enable us to maintain our present production level of work although it is not sufficient for any further development. The increased vaccine and antigen production occupies such a large proportion of the time of the technical staff that the professional officer must undertake a considerable amount of his own technical work, thus lowering the productive output of the unit.

In May of this year the clerical staff was supported by one additional post. This was made necessary by the increased flow of correspondence and clerical work arising from the augmented professional staff during these last two years.

Development of the Station

It was not found possible to extend the facilities at Gwebi Research Station during the year, and it was decided to leave these until a more opportune time and to concentrate the major portion of our investigational work on the Borrowdale Road premises, which to a large degree could be undertaken by using the existing buildings and facilities without any increased capitalization in the form of new buildings.

This meant a division of the available premises into two, the bottom stables being reserved for quarantine and Redwater and Gallsickness vaccinations, while animals under experiment were housed in the top stables. It would, however, be more advantageous if the Artificial Insemination Centre and the quarantine and vaccinations could be housed at Gwebi Station.

ROUTINE SERVICES

Diagnostic Services

The diagnostic services constitute one of the most important functions of the Laboratory. In addition to routine diagnosis carried out on behalf of the Field Department, specimens are submitted by private practitioners and farmers.

In recent years there has been a considerable increase in the number of specimens submitted, and the types of examinations necessary to obtain diagnoses become more complex each year. Such tests as enterotoxaemia neutralizations, virus antibody neutralizations, toxicity tests for plants and chemicals, antibiotic sensitivity tests, etc., are required more frequently than in the past. The produc-

tion of diagnostic antigens such as B.W.D. vibrio, C.A. and leptospiral, all accentuates the necessity for increased professional and—under our present circumstances—especially technical staff. We now have to carry strains of certain organisms, freeze dried, for reference for antigen production and for diagnoses.

Smear Examination. A total of 1,582 smears were examined during the year. The following are the details of the individual diagnoses:—

Piroplasmosis	37
Anaplasmosis	9
Theileriosis	17

The importance of this condition is increasing—an examination of the report by A.D.V.S.(F) will show the number of deaths attributed to this cause. In certain areas, Sinoia for instance, the losses appear to have been particularly heavy. Outbreaks are at present associated with some relaxation in tick control. Using material supplied from this Laboratory, Dr. Neitz has shown by cross immunity tests at Onderstepoort that this condition is identical with Corridor disease.

Trypanosomiasis	279
Tuberculosis	3
Heartwater	3

An outbreak of heartwater in a dairy herd within a few miles of Salisbury was diagnosed by transmission experiments and demonstration of the parasite in the hippocampal smears from the experimental animals. Salisbury, which lies 4,825 feet above sea level, is well outside the area in which Heartwater can be expected to occur and the origin of the outbreak was considered to be through the introduction of animals from a heartwater area carrying ticks.

Such carried ticks do not establish themselves where the climatic conditions are unsuitable for them to breed but they may survive for over a year. In this case the tick carriers were introduced on to a camp at the end of May and were removed in November. The dairy herd were put on that same portion of the farm towards the end of December, and the first mortality occurred in mid-January. The post mortem lesions encountered did not appear to be typical of Heartwater and rather closely resembled those often seen in Gonderia lawrencei (Theileriosis).

Anthrax 4

These were merely confirmations of the outbreaks in the Native Reserves which caused such a marked increase in our vaccination programme.

Spirochaetosis 2

Cases of spirochaetosis have been reported where the infecting strain appears to be extremely virulent. The history, however, appears to suggest that this is only in cattle recently brought on to an infected place—possibly highly susceptible. Endeavours to obtain such strains for experimental work have so far been unsuccessful.

Serological Tests. During the year, 3,412 agglutination tests for *Contagious Abortion* were undertaken revealing 403 positive results which involved 49 infected premises. In addition, 18 milk ring tests were done, four of which were positive.

Other Diagnostic Methods

A total of 5,252 specimens were submitted during the year and the following conditions have been diagnosed.

Rabies 41

A total of 169 specimens were received for diagnosis and were examined histologically. Although it is routine that a biological test is undertaken with all histological negatives we were this year unfortunately unable to follow out this procedure over a period of four months owing to an outbreak of disease in our mouse colony. During this period, certain selected specimens were forwarded to Onderstepoort, where the Director of Veterinary Services kindly undertook to have the tests done for us.

The following is the classification of the 41 positive cases:—

30 dogs, 3 of which were vaccinated.

6 jackals.

2 humans.

Our routine method of dealing with suspect cases is for the Field Officers to remove the brain from the suspect animal, divide it into two longitudinally; one portion is put into 50 per cent. glycero saline and the other into 10 per cent. formal saline. At the Laboratory the hippocampus is removed from the formal saline portion and three small cross sections rapidly fixed through acetone, to acetone plus butyl alcohol, to butyl alcohol and finally blocked in paraffin wax. The sections are stained by a modified Sellars method.

This rapid method enables us to obtain a positive result within approximately two and one half hours after receiving the fixed specimen.

Tuberculosis 3

All three specimens proved to be bovine in type—we have yet to demonstrate avain type in cattle or in pigs; even in poultry we only have one record of Tuberculosis in 25 years.

Quarter Evil ... ... 16 cases

C. Septique ... ... 8 cases

Considerable interest is being paid to the isolation of this latter organism from carcasses.

We do produce a mixed vaccine which is used on those farms where the organism has been picked up, but even on such premises where the infection was diagnosed, the mortality was extremely low in unprotected cattle, suggesting either that the pathogenicity of the organism under our conditions, is low and may require some trigger factor or that it is merely a post mortem invader and as such is not important. Enquiries are being made to other laboraories in Africa on the incidence of the condition and investigations are proceeding here.

In our diagnostic department Mr. Phillip reports that two cases have occurred where C. septique definitely masked a C. chauvoei infection and he felt that without the use of passive immunity tests using mono specific antisera it would be very difficult to detect the presence of chauvoei in a specimen contaminated with C. septique. We hope to investigate the matter more fully in the coming year.

Calf Paratyphoid ... ... 9 cases

This is essentially a dairy herd problem where close contact is maintained between members of a herd and their calves. Although we have never confirmed it, continuation of infection is probably due to adult carriers. We have had, in the past, a report from one ranch where night kraaling was the rule, but no material was forwarded for confirmation.

Mastitis ... ... 121 cases

Mastitis is becoming increasingly important in our dairy herds and there is no doubt that much more farmer education is required, pointing out the importance of a good milking hygiene rather than the optimistic use of the many antibiotic treatments available. Streptococcal mastitis continues to account for the major portion of our positive cases.

Poisoning ... 74 cases

Arsenic is our most important cause of poisoning—accounting for 71 cases. The indestructibility of this metal is its most dangerous property and of course, the fact that its so common use as a dip breeds a certain amount of contempt instead of the respect it should command.

It must be realized that this figure of 71 represents only a portion of the loss this very potent poison levies on the cattle industry each year, mainly because of careless handling.

One interesting case of nitrate poisoning was diagnosed in sheep; it was considered to be due to grazing on heavily fertilized old tobacco lands.

Tuberculin Tests — 43. These were undertaken on animals imported from such countries as the United Kingdom, the United States of America, and the Union of South Africa. One Africander bull from the Union of South Africa was slaughtered as a reactor. A small calcified nodule was found in the mesenteric glands which resulted in a negative biological test.

Poultry. A total of 1,213 post mortem examinations were undertaken with the following results:—

	Cases
Fowl typhoid	27
Fowl cholera	1
Fowl pox	15
Coccidiosis	248
Roup	48
Respiratory disease	18
Histomoniasis	66
Paratyphoid	5
Spirochaetosis	1
Haemoproteus columbae	2
Non-specific bacterial infection	92
Salpingitis, peritonitis, etc. Visceral lymphomatosis	75
Neuro-lymphomatosis	20
Other tumour conditions	50
Visceral gout	15
Nutritional deficiencies	46
Poisoning	7
Helminth infestation	18
External parasites	12
Improper management losses	231
Miscellaneous—traumatic injuries, prolapse, etc.	177

The majority of the above losses refer only to the Salisbury district and in most cases are submitted by the owners themselves so that a considerable amount of time is spent not only on routine diagnosis but on giving advice to poultry keepers. Although this service is free to the public it is realized that only a small proportion of actual poultry keepers take advantage of it, and it is obvious, from discussions with owners that the vast majority of losses are due to either inexperience or faulty husbandry conditions. Considerable numbers of chicks are lost every year from chilling, over-heating, respiratory conditions caused by overcrowding, nutritional deficiencies, etc. Coccidiosis, which is one of the most important causes of loss among young birds, could be reduced to insignificant proportions if strict and intelligent consideration were given to hygienic methods of brooding and rearing, housing conditions, etc. The present tendency to rely almost completely on the use of coccidiosiatic drugs, antibiotic feed supplements and the various drugs used to control respiratory infections too often leads to a slackening in good management and hygiene.

A considerable amount of further research is required on diseases such as histomoniasis, which although in the United Kingdom and the United States of America is one of the greatest threats to the turkey industry, appears in this country to be largely confined to fowls, particularly young birds. Turkeys are relatively few in number in Southern Rhodesia and are usually allowed to range over a large area. While the mortality from histomoniasis is not yet alarming there is a slow annual increase. So far we have not been able to eliminate it from a flock—presumably due to "carrier" birds or the method of survival of the parasite in the Heterakis gallinae (caecal worm).

There are considerable losses from respiratory conditions and although it is difficult to obtain a definite diagnosis of chronic respiratory disease without resorting to a complete examination of the flock it does appear that this disease is not yet of major importance.

Mortality in a batch of 312 sexed two week old Light Sussex pullet chicks imported by air from the United Kingdom was diagnosed as Paratyphoid. The deaths commenced ten days after the arrival of the birds, but specimens were not submitted until the chicks were approximately three weeks old, so that by the time a diagnosis had been established, over 50 chicks had died.

The infection was typed as S. typhimurium and cultures sent to the Salmonella typing laboratory at Colindale, London, confirmed this diagnosis.

This infection, which was considered to have been imported with the chicks, was controlled by the immediate slaughter of the imported chicks and two batches of locally produced chicks which had been in contact with the infected birds and in which disease was subsequently diagnosed.

It seems obvious that a young and growing industry such as this requires considerable help and guidance both from the disease control and husbandry aspects.

While at present we are fortunate to be relatively free of many of the poultry scourges which are found in older countries it is obvious that this will not always be so, and it is thought that a closer co-operation should exist between the Laboratory, the Field Staff and the Poultry department to give the poultry keeper the most up to date service possible on disease control and modern hus-

bandry methods, even to the extent of stationing specialists in those areas where the necessity is greatest.

PREVENTIVE AND CURATIVE SERVICES

Vaccines and Remedies

It is often difficult to persuade the farmer that prevention is better than cure; especially is this so in the case of those insidious non-spectacular diseases. With a condition such as Quarter evil it is relatively easy because of its widespread occurrence and its devastating nature once it appears in a herd—the loss of a dozen or so young animals is an example which no farmer can afford to ignore—but a disease such as Contagious abortion, which in the main, remains at a comparatively low level of infection does not get the attention it warrants.

We must increase our propaganda on the benefits of disease control by vaccination; in nearly every case the cost of protection in the herd or flock is fractional when compared with the loss of even one animal. We require to increase considerably the amount of extension work undertaken. In this country where new farms are being formed and new farmers are taking up land, disease prevention planning in terms of vaccination, lay out of buildings, purchase of animals, dosing programmes, etc., is an important and necessary adjunct to disease control.

At present we produce Quarter Evil vaccine, Quarter Evil and Malignant Oedema vaccine (mixed), Calf paratyphoid vaccine, Redwarter and Gallsickness vaccine combined, and Gallsickness vaccine, at the Laboratory, all the other vaccines are purchased from Onderstepoort Laboratories for re-sale.

Quarter Evil Vaccine. Our production of this vaccine is still increasing, 479,415 doses being sold this year, an increase of 15,300 doses compared with the previous year.

In addition, 36,830 doses of mixed Quarter Evil and Malignant Oedema vaccine were sold.

During the year it became possible to alum precipitate the clostridial vaccines, and they are now issued in this form. This well established technique improves the immunizing properties of the vaccine by delaying its obsorption from the site. The introduction of this technique was made possible by the use of 30 to 40 litre containers. We are now able to produce batches of 80,000 to 100,000 doses at one time but our present autoclave capacity is rather limited so that sterilization of these flasks has presented some difficulty and we will be forced to use steam in place of the present electrical types of autoclaves.

Horsesickness Vaccine. Doses of vaccine sold—4,453 doses—an increase of more than 1,200 over the previous year.

An extensive outbreak of horsesickness occurred throughout the country this year, chiefly of the "dikkop" type, which is the type most often encountered in vaccinated animals. Infection rate among vaccinated animals was very heavy and the mortality rate was appreciably increased. Material from several cases was forwarded to Onderstepoort, but it has not yet been demonstrated that the particular strain responsible differed from those already incorporated in the vaccine. It is thought, as has occurred in other countries in the past, that the outbreak was associated with the extremely heavy challenge resulting from climatic conditions favouring the breeding of vast numbers of the midge responsible for transmitting the disease.

Redwater and Gallsickness Vaccine and Immunization of Cattle. Out of a total of 65 animals which passed through the Laboratory Stables 43 were tuberculin tested and 49 were vaccinated against Redwater and Gallsickness.

The following are the countries of origin and the various breeds represented:—

Countries:—29 animals ex Union of South Africa, 19 animals ex United Kingdom, nine animals ex the United States of America, seven animals ex Nyasaland and one from Southern Rhodesia.

Breeds:—Jerseys 17, Africander 11, Hereford 7, Hissar 7, Shorthorn 5, Friesland 4, Brahmin 4, Santa Gertrudis 4, Sussex 3, Ayrshire 1, Aberdeen Angus 1, North Devon 1.

This comparatively small number of animals passing through the stables confirms the trends shown last year both in the drop of total numbers and the comparative increase in the importation of types of Zebu origin.

This fall in numbers has enabled us to use one stable only for imported cattle and retain the other for experimental animals.

With the exception of one ranch where in the past Redwater has proved a problem, the supply of the mixed Redwater and Gallsickness vaccine is almost wholly used by pedigree breeders and dairy farmers; smears are usually supplied from animals on the seventh, ninth and 11th days for Redwater and the 25th 30th and the 35th days for Gallsickness. In June of this year we unfortunately lost the vaccinal strain of Redwater—both inoculation of large quantities of blood, and splenectomy were tried in a vain endeavour to recover it—and had to import a new strain from Onderstepoort, which appears much less virulent than our previous strain. A total of 8,456 doses of this mixed vaccine were issued. Several large ranch combines again used our Gallsickness vaccine of which we issued 17,531 doses.

The use of the combined Redwater and Gallsickness vaccine is restricted to animals under 10 months of age, and the Gallsickness vaccine to animals under one year.

Contagious Abortion Vaccine. A considerable increase in the use of this vaccine was recorded, 87,091 doses being sold as compared with the previous year's total of 61,762. Following the publication of recent work in the United Kingdom we advise one inoculation only, between the sixth and 10th month of age of all heifer calves as being effective in controlling this condition.

Anthrax Vaccine. Outbreaks of this condition in Native reserves in the Bulawayo and Gwelo district are responsible for the considerable increase in the use of Anthrax vaccine during the year—the total number of doses used being 300,461, approximately double last year's figure of 153,790.

Very little vaccination is undertaken in areas where no disease exists; the policy in operation is to vaccinate all stock for three successive years where outbreaks occur.

Calf Paratyphoid Vaccine. A very considerable drop was noted this year in the sales of this vaccine; only 6,270 doses as compared with last year's figure of 22,406. The drop was principally due to the fact that a large ranching concern failed to keep up their vaccination campaign commenced last year.

Four hundred and ten doses of adult paratyphoid vaccine were sold. It is difficult to see why this type has not become more popular, because it does eliminate the risk of shock, associated with the calfhood vaccination.

Blue Tongue Vaccine. Again an increase was recorded in the use of this vaccine, 4,250 doses being sold. Only among black headed Persian or native sheep do we not advise the use of this vaccine on account of their natural resistance to the condition; all our other breeds are susceptible and must be vaccinated.

Enterotoxaemia Vaccine. The extending interest in sheep is without doubt responsible for the increased use of this vaccine—5,550 doses were sold during the year.

Rift Valley Fever Vaccine. 2,525 doses of vaccine sold.

Fowl Pox Vaccine. This vaccine is used consistently among our poultry keepers, 329,400 doses being sold.

Fowl Typhoid Vaccine. The change in policy, i.e., use of good hygiene and the spot agglutination test to obtain elimination of this condition is reflected in the fact that only 100 doses of this vaccine were sold during the year.

Remedies. The sale of these products has declined considerably during the last few years owing to the increasing number of commercial firms entering this market, and indeed our only reason for retaining stocks is that they serve as a point of contact with the farmer and his problem.

Tetram	57 gallons
Nodular Worm Remedy	583 tins

ARTIFICIAL INSEMNIATION

The artificial insemination centre is under the supervision of Mr. Roberts, and the accompanying details are submitted by him.

Doses of Semen Used

	1957/58	1956/57	1955/56
Salisbury Inseminator	1,831	2,318	1,869
Bulawayo Inseminator	817	531	72
Gwelo Inseminator	347	—	—
Supplied to Farmers, Salisbury	1,066	641	973
Supplied to Farmers, Bulawayo	40	—	—
Supplied to Farmers, Gwelo	14	—	—
Veterinary Department: Animals	86	56	74
TOTALS	4,201	3,546	2,988
Total doses Friesland Semen	3,740	3,019	2,534
Total doses Jersey Semen	461	527	454
TOTALS	4,201	3,546	2,988

Comparison of semen used by Inseminator on Epi-vag Farms and other Farms

	Salisbury			Bulawayo			Gwelo
	1957/58	1956/57	1955/56	1957/58	1956/57	1955/56	1958
(*a*) Epi-vag Farms	625	1,031	1,112	244	270	44	52
(*b*) Other Farms	1,206	1,287	757	573	261	28	295
TOTALS	1,831	2,318	1,869	817	531	72	347

Details of Mileage Covered, 1957-58

	Salisbury	*Bulawayo*	*Gwelo*
(*a*) Veterinary Department, Animals	938	—	—
(*b*) Epi-vag Farms	10,186	5,515	484
(*c*) Other Farms	14,194	8,632	3,832
TOTALS	25,318	14,147	4,316

Revenue, 1957-58

Mileage — 26,658 miles at 1/- per mile	£1,332	18	0
Inseminations — 2,898 doses at 15/- per dose	2,173	10	0
Inseminations — 97 doses at £1 per dose	97	0	0
Semen Issued — 1,120 doses at 15/- per dose	840	0	0
Railage	47	4	3
TOTAL	£4,490	12	3

It will be seen that there has been no significant increase in the service in the year under review.

The drop in the number of doses used in the Salisbury area is due to the release of farms from quarantine restrictions for Epi-vag. This tendency was noted in last year's annual report, and unless the service is made more attractive to farmers by a reduction of cost it is unlikely that there will ever be an increase in the number of farmers using the service. It is gratifying to record a slight increase in the Bulawayo area, but numbers are so small in this important dairying area that it is doubtful if they are significant.

Friesland breeders are openly critical of the method of selection of the last two bulls which have been added to the A.I. stud, and there is no doubt that unless better quality bulls are provided the service will remain unattractive to the owner of better class animals. The service was initiated as a disease control measure but the livestock improvement aspect must also be considered if the service is to make progress.

Conception Rates. Within the year a system of recording suited to the requirements of the service was introduced and the same system is now in operation at all three centres.

Reference to these records shows the following results for all centres:—

Number of First Inseminations Performed	1,281
Non-Return at 3–6 months	900
Conception Rate Expressed as percentage	70·2%

The Bulawayo figures are interesting in that they show that results obtained with deep frozen semen at this centre are better than ever obtained previously with fresh semen.

Individual herd owners in the Bulawayo area have also noticed this and it it reported that owners would not welcome a return to the use of fresh semen.

Comparing the results at Bulawayo and Gwelo to date it appears that we can expect, at centres remote from the Laboratory, better results with deep frozen than with fresh semen.

The long journeys to which fresh semen is subjected in this country appear to have an adverse effect on it. This effect is most probably caused by unavoidable temperature variations within the flasks used for transport. Deep frozen semen is, of course, maintained at —79°C. constantly.

Once again the conception rate figures show that our inseminators are achieving very satisfactory results, and that lack of progress can in no way be attributed to poor results.

Staff. The service is at present operating with three whole-time inseminators and one part-time, all four inseminators being fully trained and proficient. All inseminators are engaged in other duties when the demands of the service permit.

The service is supervised by the veterinary officer engaged in investigation of bovine infertility. When requested, or when time permits, this officer investigates herds obtaining poor results with A.I. It is envisaged that as the service progresses, investigations of unsatisfactory results, in consultation with the owner's veterinary surgeon, will form an important part of the service.

Successful breeding, whether by A.I. or natural service, demands good management, but this, unfortunately, is by no means universal in our dairy herds and without it and the co-operation of the owner, veterinary advice is of little avail.

The New Centre at Gwelo. We are pleased to be able to record the opening of a new centre at Gwelo in mid January, and we are following its progress with interest. One cannot expect an immediate switch to A.I. in any given area and we hope that the turnover at this centre will increase considerably after it has been established for a year or so. As stated above, a reduction in the cost to the owner would prove a great incentive at this and the other two centres.

Bulls. The Friesland Stud has within the year been increased to four bulls.

The one Jersey bull in the stud became sterile in November, 1957. This bull had been supplied by certain members of the Rhodesian Jersey Club, but it does not appear that a replacement will be forthcoming. We were fortunate in obtaining on temporary loan a bull from Henderson Research Station. The demand for Jersey semen is so small that the provision of a bull by the government is not an economic proposition.

Under present conditions it is difficult to provide a satisfactory service for Jersey and other breeds when the demand is so low compared with Friesland.

The only hope for the Jersey and other minority breeds is the development of the deep frozen service which is discussed below.

The possibility that the sterile Jersey Bull will regain his former fertility must be regarded as very remote as he has received every possible treatment.

The use of Deep Frozen Semen. Since 28th August, 1957, the Bulawayo sub-centre has been operating entirely on deep frozen semen with very gratifying results. Figures for comparison purposes are small but show an improvement over results previously obtained with "liquid" semen at this centre.

The possibility of extending the use of deep frozen semen under present circumstances has been thoroughly explored. So long as dry ice must be imported from Germiston, in the Union of South Africa, such extension would be impossible on economic grounds alone. We have been reliably informed that dry ice manufacture will commence in Southern Rhodesia "in the near future" and the commencement of such would immediately make it possible for us to increase our deep frozen service. This would offer the following advantages within the areas served by centres:—

(1) Nomination service, as a routine.

(2) The provision of a service for the "minority" breeds by the importation of semen from Europe and South Africa.

(3) The provision of imported semen from exceptional sires for those who wanted it and were prepared to pay for it.

(4) Operation with fewer but better bulls.

(5) The exploitation to the fullest advantage of a sire in the service discovered to be prepotent—even after his death.

We look forward to the time when we will be able to obtain dry ice cheaply and regularly.

Field Trial with I.V.T. Semen. Reports claim that semen prepared by the I.V.T. method will produce excellent results for up to seven days, instead of the maximum of three days in the case of fresh semen.

The advantages of this are obvious and semen so prepared could be useful in this country, even if the deep frozen service expanded.

Final results of a field experiment carried out on 100 heifers at Matopos Research Station with I.V.T. semen from the Laboratory are not yet known but preliminary reports indicate that good results have been obtained.

This trial has unfortunately already shown that this type of semen is also susceptible to the effects of travel and that it must also be stored as carefully as fresh semen.

For use throughout the service deep frozen semen would seem to offer many more advantages than I.V.T. semen.

I.V.T. semen could however, play an important part in the case of centres with no access to dry ice supply, or for supplying to owners outwith the areas covered by the centres who were prepared to inseminate their own cows. This type of semen could of course only be available from bulls kept at the centre.

Pilot Trial at Bulawayo. As a result of negotiations with the Dairy Marketing Board, it is proposed to run a trial at Bulawayo at the reduced fee of 25s. per insemination within a 30-mile radius. It is considered that the reduced fee would give the service the boost that it so badly requires.

INVESTIGATION AND RESEARCH

Contagious Bovine Infertility

Further observations during the year support the impression gained last year that the syndrome previously associated with the term "Epi-vag" does not appear to be specific and possibly includes such diseases as Vibriosis and Corynebacterium infections.

Previously the difficulty of accurate diagnosis due to limited laboratory facilities made the separation of the various conditions impracticable and it was convenient for administrative purposes to exercise control of them under this term.

It is obvious, in the light of present knowledge, that much investigation is necessary into these breeding conditions, and careful examinations of all available evidence essential before a herd is put into quarantine. It is considered that only by investigation of individual suspect herds can any progress be made in discovering the causes of the various disease conditions comprising the syndrome.

It was considered that for experimental work the material which seemed most likely to be of use in transmission experiments was the "red granulation type" of peritonitis and pleurisy lesions found in epi-vag herds in this country, and which have always been considered to be associated with this type of infection.

This material was obtained with sterile precautions immediately after death from animals on four farms. The lesions were ground and suspended in normal saline in a tissue grinder and used immediately for transmission experiments as follows:—

Three adult bulls and one cow were injected intraperitoneally with 20 ccs. of the suspension. Two bulls were slaughtered after a period of nine months and neither animal showed any healed or active lesions of peritonitis, pleurisy or epididymitis. A very small area of healed peritonitis was noticeable on the right flank of one of the animals. The cow injected has not yet been slaughtered for examination nor has the third bull.

Five adult bulls had similar material injected into the tunica vaginalis on one side. One of these bulls developed an acute local reaction which subsided and finally the testicle became completely atrophied on the side injected. The classical epididymitis lesion of "epi-vag" was not produced.

One adult bull had similar material injected intravenously, but neither a local nor a general reaction was produced. This animal has not yet been slaughtered, but after a period of one year is still quite normal.

All the above nine experimental animals were carefully observed after the various attempts of transmission and none except the one bull mentioned developed local or generalized reactions.

One cow had similar material injected intra-uterine three days after calving, the period of maximum susceptibility to intra-uterine infection. Neither local nor generalized reactions have been recorded after a period of nine months.

An Attempt to Produce Epididymitis Lesions by the use of the Sclerotising Agent Ethanolamine. This experiment was carried out during Prof. Rasbech's visit at his suggestion.

A temporary local reaction was perceived in the bull selected, but the animal returned to normal. The animal was slaughtered nine months after the experiment, and both testes and epididymes were found to be absolutely normal.

The following are comments on the various manifestations of epi-vag:—

1. *Vaginal Discharge.* The type of profuse discharge, described as common many years ago, is difficult to find now-a-days and its investigation is therefore impossible.

The discharges seen today can often be attributed to other causes.

2. *The Lesions of Peritonitis and Pleurisy.* The picture here is very confused. Observations during the year make it appear that these lesions may be produced by several factors, the principal being ascending bacterial infections from the genital tract.

3. *Epididymitis.* Prof. Rasbech gave his opinion that the lesions occurring in epi-vag herds were of many different kinds with probably many different causes. However, as cases of the classical epididymitis do occur with unfailing regularity—although not so commonly as in former years it would appear that this condition is worthy of investigation per se and this is the present line that epi-vag investigations are taking at the Laboratory. The condition appears to be purely local and is being investigated from that point of view.

The epidemiological picture presented today appears, from the records available and from information supplied by Field Staff, to vary considerably from that seen several years ago. Previously it was quite consistent to find epididymitis, pleurisy and peritonitis, and vaginitis and vaginal discharges present in the one herd. Now it is the exception, so much so that it is difficult to see the correlation between the three conditions. One very noticeable feature is variation in character of the vaginitis which when present today is of a far less violent character.

There is no doubt today that this condition economically rates far below that of vibrio foetus, which, although we have as yet no true knowledge of the amount present in the country, can have devastating effects on the fertility and milk yield of infected herds.

Examinations of Epididymitis and Peritonitis/Pleurisy Specimens Pathalogically. Dr. Ross, Government Pathologist, kindly undertook to help with these examinations. Unfortunately pressure of his own work has prevented him from proceeding with these investigations. He has already given his opinion, as a result of examinations, that the peritonitis/pleurisy lesions presented to him are of infective origin, but he is of the opinion that they might easily be secondary to a variety of conditions.

Vibriosis

Number of Samples Tested	909
Number of Herds in which Positive Reactions were Obtained . .	17

Field investigation of this condition and the development of field and laboratory techniques for its diagnosis have constituted a very important part of work on bovine infertility during the current year.

The revelation that this condition, which is responsible for serious economic loss in dairy herds and probably also in ranch herds, is by no means uncommon in Southern Rhodesia certainly justifies the attention that it has received during the year.

Tests have been carried out with antigens from British, South African, Danish and American sources. As testing proceeds we hope to be able to reduce the number of the antigens used and thereby simplify the testing.

The various authorities on Vibrioisis in the above countries have been consulted and, without exception, emphasize the difficulties which are encountered with the production of antigens.

We have been obliged to these various sources for supplies of ready-made antigen and for helpful advice which has been freely given. In particular we wish to record our appreciation of help received from the following authorities:—

Prof. Rasbech and Dr. Blom, Denmark.
Messrs. Lawson and MacKinnon, Weybridge, England.
Dr. van Drimmelen, Onderstepoort, S.A.
Dr. Plastridge, U.S.A.

Without the antigen which they supplied the serious shortage of technical staff at the laboratory would have impeded any progress with the laboratory diagnosis of this condition.

During the year a change has been made from the method of testing favoured by the Dutch and British to that developed in Denmark. The latter, which involves the use of a gauze vaginal tampon, has proved much more practical in all respects for our conditions and is, indeed, the only practical method for testing ranch cattle.

The laboratory test is now on a sound and practical basis but the preparation of antigen still constitutes a problem.

Antigen is not available commercially anywhere in the world and we must eventually produce our own. A limited amount of antigen has been produced at the laboratory during the year, but, if further testing is to be undertaken, we will require to produce more antigen at the laboratory.

The antigens employed during the year have been:—

Strain	*Source*
1980	Weybridge, England
Strain I ...	Denmark
Strain VI ...	Denmark
"Barlow" ...	Onderstepoort, S.A.
Strain "R" ...	U.S.A.

The antigenic structure of V. foetus is unfortunately extremely complicated and it will be necessary to continue using all these antigens until we can select the strain or strains that appear to give sufficient cover for this country.

The mucus agglutination test must be interpreted on a herd or group basis, and the numbers of samples submitted by Veterinary Surgeons and Veterinary Officers outwith the Salisbury area have unfortunately, in most cases, been too few to be of any significance when negative results were obtained.

Now that the tampon test has been adopted and made practical, testing could proceed much more quickly, provided technical assistance is made available for testing and antigen production.

Vibriosis in Ranch Cattle. The first survey of a ranch herd was made towards the end of the year and revealed Vibriosis in all groups except the maiden heifers, which had been mated with maiden bulls.

Control under ranch conditions raises interesting possibilities of increasing calving rates on infected ranches.

The Mucus Test and Contagious Abortion. The material collected is now tested against C.A. antigen and very interesting and highly significant results have been obtained.

In the one ranch tested during the year the test revealed a high incidence of C.A.

The fact that the test is used for both C.A. and Vibriosis diagnosis doubles its value.

Recent work proves that vaccination with S.19 does not produce a reaction in vaginal mucus and the test is the more valuable on this account.

Vibriosis Control. The diagnosis of vibriosis in any given herd inevitably involves discussion with the owner and his veterinary surgeon since this condition is not a scheduled disease.

Treatment of cows is known to produce reasonably good results but the treatment of bulls is far from satisfactory and should only be entertained when unavoidable.

The provision of A.I. facilities as widely as possible, at an economical cost, must be regarded as the only measure likely to effect satisfactory control of Vibriosis.

The control measures adopted of late have been as follows:—

A. *Dairy Herds.* (i) Herd owners within the areas in which a full A.I. service operates are encouraged to dispose of their bulls and use the A.I. service. Infected cows are, of course, treated by intra-uterine irrigation of 1gm. of streptomycin—this irrigation is repeated at 48 hours.

(ii) Herd owners outwith A.I. areas have several alternatives, none of which is ideal.

(1) Bulls may be treated with 5 gms. streptomycin, given subcutaneously for five successive days and then allowed to serve treated cows naturally.

(2) Bulls may be treated and used for A.I. of treated cows.

(3) Clean maiden bulls may be purchased and used for A.I. of treated cows.

(4) Disposal of bulls and insemination of all animals with semen obtained from the Laboratory. Once again infected cows should be treated.

Measures (2) and (4) have been chiefly employed in infected herds with varying degrees of success, but this is largely dependent on the standard of management.

B. *Ranch Herds.* Testing and diagnosis has just recently started in ranch herds.

It is intended that the following control measures will be advised.

(1) The purchase of maiden bulls for heifers coming to service for first time and their retention with such groups in succeeding years.

(2) Treatment of all adult bulls at the commencement of each breeding season. With this policy infection should become less with each succeeding breeding season.

It is realized that under ranch conditions this will entail careful management as regards fencing, etc., to avoid contact of older groups with younger groups.

Brucellosis

Diagnosis. In the past, brucellosis has been diagnosed by the use of the blood agglutination test, the milk ring test and by isolation of the infecting organism from the aborted foetus. To bring us into line with the majority of the laboratories in Africa, we are now adopting the use of the International unit system in the standardization of the serum agglutination test and basing the test on the Weybridge method which is rapidly becoming the International method.

The milk ring test (using haematoxylin or tetrazolium stained antigen) is an extremely sensitive and useful test in the detection of infected herds, but if used on vaccinated herds all the vaccination must have taken place under the age of 18 months otherwise interpretation of the test is difficult.

There is no absolutely reliable means at present of differentiating on serological grounds between (a) a cow vaccinated as an adult or subjected to repeated vaccination and (b) an adult vaccinated but having active infection.

The mucus agglutination test shows definite promise as a differential test. The presence of so-called "local antibodies" in the vaginal mucus practically always denotes infection. This test is at present under investigation at this laboratory and all vaginal mucus tests for vibrio infections are now routinely put up against the brucella antigen. This test is advantageous in that (1) according to workers in the United Kingdom, vaccinated animals were negative to the mucus test when tested within 14 days and were still negative at 12 weeks and (2) when testing ranch herds during the vibrio foetus survey there is no need to obtain a blood or milk sample as well as mucus in order to diagnose Contagious Abortion.

Control. Accumulated evidence from controlled experiments in the United Kingdom, the United States of America and elsewhere has now definitely shown that:—

(1) The questionable advantages of adult vaccinations are insufficient to warrant its practice in herds where future efforts to eradicate bovine brucellosis are contemplated within the next five years.

It is considered that the best results are obtained with the use of S.19 vaccine on these herds where calfhood vaccination is combined with a test and eradication scheme.

Apparent breakdowns to the vaccine are in fact invariably associated with the presence of a considerable weight of infection on the premises.

While it is recognized that vaccination will greatly reduce the incidence of the disease, eradication cannot be achieved by use of the vaccine alone.

Our present policy is voluntary vaccination which means that the more enlightened farmers will vaccinate on a preventive basis and the others only in a dilatory panic to mitigate losses. In the United Kingdom a calfhood vaccination scheme has been introduced which has been extremely useful, and which is usually undertaken by government officials on their visits to the farms on tuberculin tests, etc.

In America very rapid progress has been achieved by the test and eradication method combined with vaccination.

Obviously the use of either of these two last methods would involve use of government officials as vaccinators and possibly compensation for animals to be removed from herds.

At present we have no control on the disposal of the reactor animal which constitutes a possible risk to both animal and man.

There is considerable evidence to show that brucellosis, both acute and chronic, is a serious milk-borne disease of man, and while pasteurisation has already greatly reduced the incidence of disease in the city and urban districts, this does not apply to the country districts and to farms where the person who handles both milk and the cow is exposed to infection. In this respect it is not necessarily the cow which aborts that is the greatest danger, but rather the aborted animal brought into the herd, and which sporadically or continuously over a period of years excretes viable organisms in the milk and, as such, exists in a vaccinated herd.

The present work in progress is standardization of the production methods of the antigen itself and of the agglutination test: in addition the development of the mucus agglutination test for use on adult vaccinated animals in conjunction with Vibrio testing and, lastly, the freeze drying of the internationally recognized referenced strains used as controls in typing brucella species, e.g.

Br. abortus	544 (Weybridge)
Br. melitenses	1,617 (Beltsville)
Br. suis	1,330 (Minneapolis)

The work proposed for the coming year includes the production of the diphenyl tetrazolium chloride stained milk ring antigen, and its standardization for possible survey use in the field, the production of a National standard serum, equivalent to the International Brucella abortus antiserum to be retained freeze dried and used to check the antigen; some assessment of the present infection rates in cattle in Southern Rhodesia and establishment of a liaison with the Health Department regarding studies on the source of human cases.

We have effective tests for the detection of this condition and we have a very effective vaccine for its control; increased publicity of the usefulness of these will effect control of the disease and, we hope, lead to the establishment of a scheme for eradication.

Mastitis

An increasing number of requests have been made over the past year by farmers and private practitioners for laboratory assistance in diagnosing and helping to control severe outbreaks of mastitis in dairy herds in the Salisbury district.

It is a well known fact that most severe outbreaks, particularly of Streptococcus agalactia mastitis, can only be effectively controlled, or eliminated, by repeated testing to determine the latent carriers of infection and by undertaking extremely rigorous hygienic measures in the milking routine.

Without the full assistance of a laboratory these costly outbreaks of mastitis can never be brought under complete control. There have been several instances over the past year where, despite the wholesale use of practically every available antibiotic, the course of the disease has remained virtually unchecked, until, by the systematic elimination of carriers based on laboratory tests, the disease has finally been brought under control.

Unfortunately, owing to the present shortage of technical staff, we have not been able to give more than token assistance in the majority of outbreaks. The

collection of milk samples using an aseptic technique cannot be left to the farmer or dairy manager and it is also essential that several visits be paid during milking time by a veterinary surgeon fully conversant with correct hygienic procedure in order to determine any faults in the milking technique and give advice generally.

From the laboratory aspect a proper examination of milk samples entails:—

(a) Direct plating onto selective media.

(b) Microscopic examination of incubated stained samples for Streptococcal infection and estimation of leucocyte count.

(c) Plating onto blood agar of any samples that are negative to tests (a) and (b) to determine the presence of organisms other than Streptococcus.

(d) Coagulase tests to determine the pathogenicity of Staphylococci.

(e) Antibiotic sensitivity tests on bacteria (particularly Staphylococci) that appear to be resistant to antibiotic therapy.

At present it is possible to undertake all of these tests on only a very small proportion of cases as the necessary technical assistance is not available.

Again it is unfortunately not practicable to give assistance to farmers in outlying areas, as milk samples must reach the laboratory within a few hours of being taken, unless they can be refrigerated and brought in by car the following day.

A considerable amount of investigational work is needed into various aspects of mastitis in this country such as:—

The reason why Str. agalactiae infection continues to predominate in the majority of outbreaks despite the large scale use of antibiotics (which are freely available to the lay public).

The role played by flies in the transmission of the disease.

The use of Trypsin and other enzymatic digestors in treating chronic indurated quarters.

The possible use that could be made of "on-the-spot" chemical mastitis testing outfits, etc.

Anaplasmosis

The Therapeutic Effect of " Spirotrypan Forte" on Artificially Induced Cases of Bovine Anaplasmosis (A. marginale Infection). "Spirotrypan" is the trade name of a drug produced by Messrs. Farbwerke Hoechst, Frankfurt, Germany. It is described as a sulphur containing arsenobenzene, incorporating two different arsenical compounds. It is readily soluble in water and is supplied as a stabilized solution containing four per cent. Arsenic and 0.86 per cent. organically bound Sulphur.

Reports from private practitioners in the Salisbury area indicated its usefulness in the treatment of anaplasmosis, and it was therefore decided to undertake a limited therapeutic trial on a few susceptible animals at the laboratory.

The experiment may be divided into three sections:—

I *Splenectomized Guernsey Bull Calf (9 months).* This animal was inoculated with infective blood containing a virulent strain of A. marginale from the Sinoia area. The first temperature rise and appearance of parasites in the peripheral blood stream occurred on the 18th day and treatment was commenced on the 22nd day when clinical symptoms had become apparent.

Two treatments of 20 cc. Spirotrypan intraveneously were given with an interval of three days between them. Each treatment brought about a transient drop in temperature, lasting about 18 hours, but within a few days the animal began to show a very marked clinical anaemia and slight jaundice. Thereafter the disease continued in chronic form with occasional recrudescences of high temperature. The calf became progressively weaker and was finally slaughtered 42 days after inoculation.

II *Two 10-month old Friesland Steers.* Both animals were born and raised at the laboratory and known to be susceptible to anaplasmosis.

Both steers were infected by inoculation of blood containing the same strain of A. marginale as used in the first trial. Both reacted on the 14th/15th day with sharp rises in temperature and the appearance of parasites in the blood.

One animal, No. 223, was given two injections of Spirotrypan I/V; the initial dose three days after parasites first appeared in the blood, the second three days later. The other animal No. 222 was left untreated to act as a control.

The disease ran an almost identical course and both animals eventually made a full recovery, except that the treated steer (223) had a more prolonged febrile reaction and showed a more pronounced loss in condition than the untreated control.

III *Two Aged Friesland Cows (9 years' and 15 years' respectively).* These cows, though old, were in excellent condition and had been barren and dry for some years.

Both animals were inoculated with A. marginale infective blood, both reacted on the 18-20th days, but only the older animal was treated, two injections of 40cc. each of Spirotrypan being administered intraveneously at three days' interval. The treatment was given on the third day after the first appearance of parasites in the blood, i.e., when the disease would probably first have been recognized clinically under normal field conditions.

The first injection appeared to give some response, particularly with regard to the febrile reactions but there was practically no reduction in the number of parasitized cells.

Supportive treatment with purgatives and laxatives was given to both cows. Anaemia became rapidly more marked and the cow finally died 33 days after inoculation (14 days' illness). Post mortem revealed sever jaundice and anaemia, minimal atony of the rumen and a severe hepatic cirrhosis, the latter probably associated with age.

The gallsickness ran a similar course in the control animal (no treatment) and death supervened 12 days after parasites were first seen in the blood. This animal was found on post mortem to have a mesenteric lipoma involving several coils of the small intestine.

Conclusion

The administration of Spirotrypan did not appear to have any beneficial effect on the course of the artificially induced disease. Unfortunately haemoglobin estimations were not carried out but the drug did not appear to have any effect on the course of the anaemia as judged clinically and on smear examination. Neither did the Spirotrypan have any effect on reducing the numbers of A. marginale seen in the peripheral blood stream.

Poisoning

Sarcostemma Viminale Poisoning in Sheep and Cattle. The toxicity of S. viminale from the Enkeldoorn area of S. Rhodesia was established by the death of a sheep within six hours of being dosed 514 grams of freshly ground material. Clinical symptoms were grinding of the teeth, muscular tremors and markedly accelerated respiration. Shortly prior to death, galloping movements of fore and hind legs (as seen in Heartwater) and frothing at the mouth were pronounced.

Post mortem revealed cyanosis, generalized congestion of all blood vessels and petechial haemorrhages in the omentum.

Mortality amongst cattle in the Enkeldoorn district was attributed to the consumption of this plant, specimens of which were forwarded to the Laboratory for identification and toxicity trials.

Very little appears to be known about the toxicity and identification of the poisonous plants of S. Rhodesia. Far too many deaths amongst cattle are attributed to "veld poisoning".

It it hoped over the next few years to establish a fairly comprehensive poisonous plants garden at the laboratory. This will give farmers and visiting veterinarians an opportunity to become acquainted with various toxic plants as well as being extremely useful to our own veterinary staff.

Trypanosomiasis

During the year investigations were commenced into the newer trypanocidal drugs with particular reference to their toxicity, local reaction and prophylactic properties.

Two strains of Trypanosoma congolense were obtained with the aid of Field Officers and have been established and are being maintained in mice by syringe passage. One strain originates from the Karoi and the other from the Kariangwe area.

Berenil. This drug was found to have excellent curative properties against both strains when used at the recommended dosage rate of 3.5 mgm./kg. Cattle were treated when trypanosomes were found to be numerous in the peripheral circulatory system. No breakdown occurred in the seven head treated.

All the animals were subsequently challenged with the homologous strains on the 23rd day post treatment and trypanosomes were demonstrable four days later. One hundred millilitre of blood from an infected animal was used for the challenge, given intravenously. No immunity or prophylactic action of the drug eventuated.

This drug has been used with excellent results against Babesia bigemina, bovis, and canis. The effect is observed within a few hours and has much to recommend it, as regards efficacy, ease of administration and complete absence of any side effects.

Quinceronium Sulphate (Babesan). The use of this drug against T. congolense was investigated in dogs and bovines. Two dogs showing a large number of trypanosomes in the peripheral circulation were treated at the rate of 0.25 mgm. per kg. by subcutaneous injection and both were apparently completely cured and no relapse occurred during an observation period of three months.

Two cattle, both showing numerous T. congolense in the peripheral circulation were treated at the rate of 1 mgm. per kg. body weight. Both animals relapsed on the tenth day post treatment.

Prothidium. A quantity of this drug was made available by Messrs. Boots Pure Drug Co. for trial purposes.

Initially one animal was given the drug intramuscularly and another subcutaneously at the rate of three mgm./kg. body weight as a one per cent. solution. The animals were stabled during the period of observation. Immediate effects noted were salivation and excitement which lasted for a few hours and disappeared. On the second day a febrile reaction developed in both animals. The animal receiving the drug by the intramuscular route had a rise in temperature of 1.8° F. lasting for three days and then subsided, the temperature rise in the animal receiving the drug by the subcutaneous route persisted for five days with the highest temperature being 105° F. approximately 2.5° F. above its normal temperature. The condition of the animals was fair.

One of the animals was challenged periodically and reinfection had not been set up eight and a half months later.

A further three animals were introduced into the trial and they were given five, seven and 10 mgm. per kg. body weight of prothidium as a two per cent. solution by the subcutaneous route.

Bovine No. 74 received prothidium at the rate of five mgm. and No. 5 at the rate of seven mgm. per kg. body weight. Both were very fat and reacted very similarly. Neither showed a febrile reaction but immediately following the injections both animals salivated profusely, eyes were staring and the respiration was fast and shallow. Both animals went down for short periods and groaned at frequent intervals. The feet were constantly being picked up—a possible indication of laminitis. On the fourth day post injection, a marked unilateral oedema of the subcutaneous tissues of the ventral surface of the abdomen was present. This oedema extended up the side of the animals, to the site of inoculation which was over the thorax immediately posterior to the scapula and some nine inches from the vertebral processes. Local heat was present at the injection sites. There was a considerable increase in water consumption.

Bovine No. 168 received 10 mgm. per kg. This animal was in very poor condition and soon after the injection she went down and refused to eat. Salivation was also present. A febrile reaction developed—a rise of approximately 2° F. above the normal was recorded lasting for three days. Her condition deteriorated rapidly for a while, but then gradually improved until she made a complete recovery. No noticeable oedema developed.

Ten further animals have been injected with prothidium at the rate of two mgm./kg. as a two per cent. solution. Half were given the drug intramuscularly, and half subcutaneously.

One animal was sacrificed on the 17th day post injection and a post mortem examination carried out showed at the site of injection a cylindrical portion of muscular tissue two inches in diameter and four inches in length. This cylinder was surrounded by a dark red reactionary zone and was separating from the surrounding tissue.

Pigs were found to be far more susceptible to the drug than cattle and 10 mgm. per kg. was found to kill them in 15 minutes and seven mgm./kg. was also found to be lethal.

Low Fertility in Ranch Cattle

Our examinations during the past few years have shown that with ranch cattle, the breed being the Africander, it is possible to achieve a conception rate of 90 to 96 per cent. when heifers are put to the bull at three years of age.

In a group of 100 cows under study we found the following calving rate over three years.

1st calving	96%
2nd calving	38%
3rd calving	69.3%

In actual fact the figures for the third calving are not yet available but are represented by the conception rate which was finally checked about the end of September just prior to the commencement of the calving season.

This severe drop in the second calving year was noted previously but not to such a marked degree, in point of fact it was considered to be in the region of 55 per cent. The figure of 38 per cent. was originally thought to be associated with the very poor grazing on which these cattle have been put, but this year we have recorded an even lower figure for second calvers, namely 30 per cent.—a considerable drop for which at present we have no adequate explanation. We know from past work that the third, fourth, fifth and sixth, etc., calving rates vary between approximately 65 per cent. and 75 per cent. and stabilise in the region of 70 per cent.

It is, therefore, obvious that this marked drop in the second calving year is an extremely important one. Rectal examinations show that these animals, having calved down and being put to the bull for the second time, have a considerable proportion of inactive ovaries, but at the same time a greater proportion have ovaries which, though they cannot be classed as inactive because of enlargement, do not produce palpable corpora lutea. There is an enlargement of one or both ovaries which though slight is persistent over several examinations, thus they are not merely silent heats but in a grade of activity below that, yet not inactive.

It is felt that such cases are due to the fact that the general level of nutrition is not high enough to allow a large number of these heifers to calve down in October or November, produce milk to feed the calf, and then come back into heat for the January to March bulling.

There are a number of possible factors of which probably the nutritional is the most basic, and there are three entities nutritionally namely protein, minerals and vitamins.

A trial was undertaken during the past year with vitamin A, bone meal and 2 lb. protein as separate entities. The result obtained, unfortunately, because of the use of inefficient ear tags, was inconclusive, but did suggest that vitamin A was as effective under our conditions as protein. On those and economic grounds we have not included protein in the trials set up for the coming season.

It is considered that it is not necessary to keep cows on a maintenance ration during the whole of the dry season in order to obtain an economic calving level but that this may be achieved by a pre-rainy season stimulation such as we are administering by feeding vitamin A and minerals approximately six weeks before the calving season is due to commence.

In addition we are this year putting heifers to the bull six weeks in advance of the usual time, i.e., mid-November instead of January in anticipation that the six weeks' longer rest they obtain before the following bulling season will achieve a higher calving rate.

The possibility of a genetical factor being associated with low fertility is being considered and the progeny of these random selected 100 cows are now being identified. One other factor which we have not yet been able to investigate is the physiological effect of suckling on the heat cycle—work in America has

shown that the interval between parturition and the appearance of first heat is greater when a cow is suckled than when it is milked. Our records do show that the percentage of cows coming back into calf in two successive seasons is greater in the group of cows which fail to rear a calf than in the group which does rear a calf—it has always been assumed that this was due to the drain of milk and not the act of being suckled.

The dates of calving in the selected 100 cows referred to above are also being kept and it is of interest to note that 94 per cent. of the 96 per cent. calves born in the heifer year were the result of services in January and February—in fact the large majority of calves were born by mid-November. In the second calving year the bulk of the calves were born in November, but there did not appear to be an absolute connection between late calving as a heifer and non-calving the succeeding year; nor did the actual weight of the animal appear to be the deciding factor. It may be that there is a possible genetic involvement here.

It is obvious that this experiment must be carried on for a further period of calvings before definite conclusions can be drawn but it does seem quite clear that the bulling period in the heifer can be cut down to eight weeks without any appreciable reduction in the calf crop.

Parasitology

Routine. During the year 470 faeces specimens were examined for helminth eggs and coccidia.

Internal Parasites of Sheep. Some information on the seasonal variation in the worm burden of sheep in Rhodesia is probably the most urgent problem requiring investigation. In order to demonstrate any rise similar to the "Spring rise" in egg output of sheep parasites in Britain, weekly worm egg counts on the faeces from 30 ewes from three flocks under different systems of management were carried out from February.

One of the flocks was the experimental flock at the University Farm. This flock was unfortunately split up and put on varying planes of nutrition. As the groups were too small to be of value, egg counts on these ewes were discontinued. It is intended to commence observations on another flock in the near future.

To date there have been no significant variations observed in the worm egg output from these sheep.

The results of these observations are intended to form the basis of a system of management to prevent a massive build-up of worms and to cut dosing down to a minimum.

At the Gwebi Research Unit one flock is under observation. These sheep were not dosed with any anthelmintic from June—October. They were rotated on five separate veld pastures at weekly intervals. It is interesting to note that worm egg counts have remained extremely low in this flock.

The third flock under observation is a group of Wiltipers run on an irrigated pasture of star grass, being rotated every week on 14 paddocks. Three lambs born in March and slaughtered in August were carefully examined post mortem with completely negative results. It appears, therefore, that the ideal in mutton production is to produce Autumn lambs and slaughter them in Spring. They, therefore, never live during a wet season when the danger of parasitic infestation is at its height.

These sheep were dosed every three weeks with Phenothiazine or Tetrachlorethylene. This was the first crop of lambs to be born on these irrigated pastures and observations will be continued next season, to see if any build-up occurs.

Fascioliasis in Cattle. An alarming overall incidence of liver fluke occurs in the Salisbury district, and it was considered essential that close liaison should occur between this Laboratory and the Bilharzia Research Laboratory in connection with the campaign to eradicate snails in the control of Schistosomiasis and Fascioliasis. It appeared that Fascioliasis eradication would be the spearhead of the campaign, being of more obvious economic importance to the farmer.

Numerous acquaria were set up in the laboratory to breed snails in order to produce cercariae for experimental work and to check all possible snails as intermediate hosts of F. gigantica. A breeding colony of only one species was established, however, and it was heartening to learn that the Bilharzia Research Laboratory also has great difficulty in breeding some species, to the extent that they are considering importing laboratory bred Rhodesian snails from London.

One large batch of Fasciola cercariae was produced by artificially infecting wild snails. It was intended to do longevity trials under various conditions, and to observe the effects of minute concentrations of sodium pentachlorophenate and copper sulphate on these cercariae. These trials were undertaken and the cercariae fed to mice, whom Taylor and Parffit (Transact. Amer. Micro. Soc. No. 3) described as being useful to test the infectively of metacercariae.

The mouse tests were negative, a finding confirmed by Dr. Taylor of Weybridge. It appears that only F. hepatica cercariae can affect mice.

When further metacercariae are available it is intended to repeat this work with hamsters.

Six attempts at infecting Bulinus tropicus with F. gigantica miracidia failed.

Observations of the Efficiency of Some Anthelmintics Against Fasciola Gigantica. 243 culled cows to be slaughtered from a ranch where a fairly heavy incidence of Fascioliasis occurred provided an opportunity to study the effects of some anthelminthics against Fasciola gigantica.

The cows were divided at random into seven groups of 35 in each group.

Drugs to be tested were—

Hexachlorenthane (Cooper's Liquid).

Hexaphine (Cooper's Liquid Phenothiazine and Hexachlorethane mixture).

Carbergan (May and Baker—Carbon tetrachloride in arachis oil).

The groups were treated as follows:—

Group A. Received two doses (5 oz. per dose) of Hexachlorethane, 21 days apart. Before dosing each time prestimulation of the oesophageal groove was carried out with 2 oz. of 10 per cent. Sodium Chloride.

Group B. Received two doses of Hexachlorethane 21 days apart with no prestimulation.

Group C. Received a single dose of Hexachlorethane after prestimulation with 2 oz. of 10 per cent. Sodium Chloride.

Group D. Received a single dose of Hexachlorethane with no prestimulation.

Group E. Received a single dose of Hexaphine.

Group F. Received a single dose of Carbergan.

(Note: The *Hexachlorethane* contained 12 grams per fluid ounce.

A dose was therefore 60 grams.

Hexaphine contains Pure Hexachlorethane 23.3% w/w 28.3% w/v

Pure Phenothiazine 20.1% w/w 24.3% w/v

A single dose of 6 oz. contains 48 gms. Hexachlorethane

42 gms. Phenothiazine

Carbergan—a dose of 20 cc. contains 5 cc. CCl_4).

Twenty-one days after dosing, or in the cases where two doses were given 21 days after the last dose, the cows were slaughtered. The livers were examined for:—

(1) evidence of thickening and calcification of the bile duct which was presumed to be due to a previous Fasciola infestation.

(2) The presence of liver flukes.

Results

	Group	*Previous Fluke infestation*	*Live Flukes present*	*Percentage of Flukes eliminated*
A.	35	9	3	66
B.	34	5	1	80
C.	34	7	1	85
D.	31	8	4	50
E.	35	3	2	33
F.	35	16	12	25
Contr.	39	14	14	—

Discussion. It appeared that among the 243 cows concerned there was an overall infestation rate of 23.5 per cent.

The results were conflicting and only showed that Hexaphine and Carbergan appeared inferior to Hexachlorethane, and that the latter was not 100 per cent. efficient.

Stilesia Hepatica. Over 95 per cent. of sheep livers in the country are condemned due to the liver tapeworm. This is a tremendous loss, and obviously some research on this parasite appeared necessary.

The life history of Stilesia is still unknown. Being an anoplocephalid it is probable that an oribatid mite may be the intermediate host. Numerous oribatids and other soil mites were thus collected from a sheep kraal and dissected, to look for cysticercoids.

In one batch of mites, several harboured bodies extremely like cysticercoids of Moniezia were found and some of these mites were fed to worm free lambs.

± 200 true oribatids and ± 100 other mites were collected and exposed to gravid proglottids of Stilesia. These will be fed to worm free lambs.

Schistosomiasis. Le Roux (F.A.O. Report 1958) reported that bovine urinary schistosomiasis was far more common than was previously thought.

In conjunction with the Bilharzia Research Laboratory a survey on bovine urinary schistosomiasis was carried out. In 953 urinary bladders from the C.S.C. Salisbury, schistosome eggs were demonstrated in 25 (2.6 per cent.).

A large number of bladders showed haemorrhagic spots identical to early lesions of schistosomiasis, but eggs could not be demonstrated in these.

Twelve worm free lambs are being reared for an experiment to observe the effects of schistosomiasis on growth, and general pathogenic changes at various levels of infestation.

Until snail colonies are established, supplies of cercariae will be obtained from the Bilharzia Research Laboratory.

Miscellaneous

Visitors to the Laboratory during the year included Dr. Stableforth, Director of the Ministry of Agriculture and Fisheries Laboratory, Weybridge, United Kingdom, and Dr. Wiktor, of Laboratoire Veterinaire, Elisabethville, Belgian Congo.

Visits by Staff. Mr. J. R. Philip attended an F.A.O. seminar on Brucellosis held at Elisabethville, Belgian Congo, in June, 1958.

Publications by Staff

Rift Valley Fever in Southern Africa, by D. K. Shone. Central African Journal of Medicine *4* 284-286.

Some Aetiological Agents of Bovine Abortions in Southern Rhodesia, by D. K. Shone, J. R. Philip, R. M. Roberts and G. J. Christie. Journal of the S.A. Vet. Med. Ass. *29* 55-62.

I am deeply appreciative of the willing help and co-operation afforded by my staff during the year reviewed above and also wish to thank the staffs of the other departments who have assisted Veterinary Research during that period.

REPORT OF THE DIRECTOR OF TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION FOR THE YEAR ENDED 30th SEPTEMBER, 1958.

1. INTRODUCTION.

The task of re-organizing the Department so that it becomes capable of using techniques of tsetse control other than game descruction has not been made easier during this year by the general deterioration of the trypanosomiasis situation in the east and south-east of Southern Rhodesia. During the summer months the infection rate among cattle on the Eastern Border farms increased to a peak higher than in any year since 1943. With the cessation of the rains a survey was undertaken south of the Lundi River and showed that very extensive advances of tsetse fly (both *G. morsitans* and *G. pallidipes*) had occurred since 1956 in a southerly and westerly direction. Two months later the discovery of *G. morsitans* at the western edge of the Sabi operational area, and the simultaneous appearance of cattle trypanosomiasis on the most easterly of the Chiredzi Ranches and also among African owned stock in the Matibi II Reserve indicated a developing situation of extreme gravity. Finally in August the diagnosis of trypanosomiasis in the cattle of the Chiswiti Reserve in North Darwin suggested another movement of tsetse (probably on the Portuguese side of the border) many miles away from any tsetse at any time recorded in Rhodesian history.

This somewhat gloomy picture, however, is relieved by the continuing progress made in tsetse elimination in the Urungwe District, the scene of a difficult crisis in 1952 and by the progress in establishing a defence line in Southern Binga and Gokwe Districts. Elsewhere, in Eastern Gokwe (Sanyati area), in N.E. Lomagundi and in Mtoko, the position during the year has remained stable.

The extended use of insecticidal and bush clearing techniques can only be achieved by the employment of a comparatively highly trained staff, both European and African. Some progress has been made in these directions but the full effect of measures so far taken will be apparent later. The principal change has been towards devolving greater authority upon the officers in the field. In the three major areas of operations, Sebungwe (Binga and Gokwe West), Urungwe and Sabi, the field officers directly controlling operations now report through a Senior Field Officer to the Entomologist-in-Charge. This system now appears to be working well and is resulting in greater efficiency and closer co-ordination. Efforts to make the Department an increasingly efficient unit continue.

The tsetse problem is an ecological one which impinges upon many fields of rural activity. A system of local Trypanosomiasis Committees has therefore been started in districts where the Department maintains an Entomologist. Such a committee consists, basically, of the Native Commissioner, as Chairman, together with the Government Veterinary Officer and the Tsetse Entomologist. The Chairman is empowered to co-opt such other officials or non-officials as he wishes. The intention of these committees is primarily co-ordination. The tsetse programme and the prophylactic and therapeutic measures carried out by the Veterinary Department can be outlined and explained to representatives of other departments as well as the local farming community and the need for collaboration in such matters as control of cattle movement, grass fires, etc., explained. On the other hand, developmental schemes of various kinds, e.g. native settlement schemes, road building, labour recruitment, etc., which may influence or be influenced by anti-tsetse operations, may be discussed. At present, owing to the heavy pressure of work on the shoulders of entomologists, it is desired to keep such meetings to a maximum of two per year. The minutes of these committees are considered by the Tsetse and Trypanosomiasis Control Committee which meets monthly in Salisbury.

Also in pursuit of closer co-ordination two meetings were held during the year with the Head of the Anti-Trypanosomiasis Commission of Portuguese East Africa, Dr. M. A. Andrade Silva. On the second occasion the Director and the Entomologist-in-Charge of the Sabi area accompanied Dr. Andrade Silva and some of his staff on a tour of the tsetse belts adjacent to the Rhodesian border, and acquired much useful information.

The main method of tsetse control used during the year was still game eradication and this will continue to be the case for some time. However, more careful control of hunting, both by the use of fences and by closer supervision by Field Officers, results in the confinement of slaughter to smaller areas

and a reduction in the numbers of game killed. This year 14,911 animals were killed as opposed to 18,003 last year. Both figures are small in comparison with earlier years, but it should be noted that it is most unlikely that next year's figures will show any marked reduction as compared with this year's. Not until the fenced areas are shot out will further appreciable reductions occur. There is no intention of relinquishing game destruction entirely as a method of tsetse control, but it will only be used when strictly necessary to supplement and accelerate other measures.

On the investigational side there have been two innovations. The first, the setting up of a small unit, with an Entomologist and African Assistant, to undertake examinations of the infection rates of tsetse flies, especially in connection with trials of new drugs being carried out by the Trypanosomiasis Section of the Veterinary Department. The second innovation has been the attempt to set up a laboratory colony of tsetse (*G. pallidipes* and *G. morsitans*) in Salisbury. The object of this is to maintain a stock of flies on which simple tests, e.g. on the residual killing effect of different insecticides, may be carried out. The colony is based upon supplies of pupae collected near Kariangwe. From the same source pupae are supplied to the Zoology Department of the University College of Rhodesia and Nyasaland where research on various aspects of tsetse behaviour is being undertaken.

Various other items of an investigational nature are reported on below.

The Director attended the 7th Meeting of the International Scientific Committee for Trypanosomiasis Research which was held in Brussels in August and, early in the following month, the 6th International Congress on Tropical Medicine and Malaria in Lisbon.

Whatever may be the arguments for or against game destruction as a means of veterinary sanitation, it is a matter for regret that so much slaughter has taken place without advantage being taken of opportunities for increasing knowledge. It is therefore gratifying to note that members of the staff of the Zoology Department of the University College have visited the Sabi Valley Operations area and arranged for observations to be made on various aspects of the game shot. In the same way, also in the Sabi area, opportunity is being taken to take blood slides of animals shot to provide material for the Veterinary Research Laboratory to undertake an investigation of trypanosome infections in the wild game.

2. DISTRICT REPORTS

A. Sebungwe.—By D. F. Lovemore, Entomologist.

(1) Introduction

During the period October, 1957, to September, 1958, the reorganization of the shooting operations was completed and the shooting resumed, the aim being to consolidate our southern position. Certain surveys and investigatory work were carried out. Generally progress in all aspects of the work in the Sebungwe area has been satisfactory.

(2). Reclamation and Control Operations

(*a*) *Shooting Operations.*—As a result of a progressive deterioration in the tsetse situation in the Lutope, Mzola, Kana and Lubimbi areas it was decided in 1956 to reorganize the shooting operations on certain lines recommended by the Commission of Inquiry on Human and Animal Trypanosomiasis in 1955, namely the use of fences and the more rigid control of hunters; the aim being to achieve as rapidly as possible a game and tsetse free belt north of the settled area described above.

The reorganization was generally carried out during 1957 and in this period the operations area was redefined and reduced by half in depth, a game fence 96 miles long was constructed along the northern edge of the area, the cattle fence was extended 35 miles in an easterly direction, four new field officer camps were built (this was necessary to accommodate the increase in staff) and many miles of new roads and tracks were cut. It should also be mentioned that during this period all shooting was suspended and the labour so released was utilized on the above work.

The reorganization was almost complete by the beginning of the period under review and in December, 1957, the shooting operations were resumed, though on a limited scale because of heavy rains and certain labour difficulties; this labour situation continued until May of this year but in June the operations were expanded to the planned strength and have continued at this since then.

The organization of the present shooting operations is based on rigid control of hunters for it is believed that only by accentuating this will success be obtained; this control is achieved as follows:

(i) The elongated area is divided into four sections of approximately 300 square miles each and each section is controlled by a European field officer and thirty hunters (the Cewali section has forty; this increase was made in order to achieve a more complete coverage).

(ii) The hunters are stationed in groups of five in strategically situated camps with one hunter at each camp in authority.

(iii) Hunting camps are linked by roads and this enables the field officers to make frequent checks on hunters and to issue ammunition and rations at the actual camps.

(iv) Each field officer has an African assistant who checks randomly on the camps.

(v) Hunter teams are switched frequently between camps; this is done to prevent hunters becoming too familiar with the various areas.

It should be mentioned at this point that the hunter strength within the operations area is supplemented to some extent by the issuing of rifles to "hunter control" assistants and fence guards.

During the period under review 3,130 animals, other than elephant, were destroyed and of this number 85.4 per cent. were small animals, that is duiker, steenbok, Sharpe's grysbok, warthog, bushpig and baboon. It should also be noted that steenbok and Sharpes grysbok were only shot for the first time in these present operations in September, 1958.

The elephant problem which at one time was a considerable worry has now been brought under control by the combined efforts of the Game Department, Wankie National Park staff and our own field officers. Only a few individuals of the old resident herds remain within the area and there are the occasional incursions of herds from the north and east. A total of 149 elephants were destroyed in the operations area during the year.

Considerable store is set upon the game fence preventing movements of big and medium game animals from the north and consequently the fence is patrolled daily by African guards on cycles in order to maintain the good state of repair. It is of interest to mention that the efficiency of the game fence was greatly increased by the hanging of pieces of iron cut from old aerosol drums along those sections where breaks were occurring most frequently.

The exceptionally heavy rainy season caused considerable damage to the roads and tracks in the area and it was only as a result of determined efforts on the part of field officers that these were made negotiable again. About 400 miles of road were maintained and some 140 miles of new roads were cut.

The appointment of a senior field officer in an executive capacity to co-ordinate the shooting operations has gone a long way to achieving efficiency.

(*b*) *Traffic Control.* Traffic control has continued to be a major feature of our operations and during the past year thirteen control points have been in operation. Eleven of these control points cover roads passing through the shooting operations area and the remaining two cover roads which have become important as a result of the Batonka resettlement scheme, namely the Binga-Kamativi road and the Siabuwa-Gokwe Road.

A Swing fog machine was used throughout the year at Mzola gate on all south bound motor vehicle traffic.

(*c*). *Aerial Smoking Campaign*: Lubu Valley. Observations have been carried out regularly within the Lubu Valley on both flyrounds and random traverses in order to follow the results of the aerial smoking campaign of 1957 and it is pleasing to record that to date the tsetse population still remains at a low level over the greater part of the valley. It should, however, be noted that there are places where a build-up is occurring, namely in the vicinity of the junctions of the Chicomba and Kariangwe rivers with the Lubu, the Mtshezu river and the Mbelele river. This could have been avoided had Batonka resettlement been of the density originally envisaged. The position might still be consolidated in the coming year by further settlement.

(3) Survey and Tsetse Distribution.

Survey still remains the most pressing problem in this area as elsewhere and only a fraction of the survey work planned for the year was carried out, namely

the area to the west at Kariangwe and parts of the Lubu Valley. More satisfactory progress should be made as staff becomes better trained.

(*a*) *The Area West of Kariangwe.* The survey of the area to the west of Kariangwe covered the Maseme river and its tributaries, the Munde river and its tributaries, the Nagupande river between the Bolisa-Nagupande junction and the Manyande-Nagupande junction, the Mabobolo and Chicomba rivers, the Siafwa-Upper Siazundu river and the headwaters of the Matibi river.

G. morsitans was found to occur in high density as far west as the headwaters of the Munde and in low density on the middle and lower Munde and its western tributaries, the Mabobolo river and the Siafwa-Upper Siazundu river. These results indicate an advance of *G. morsitans* since records of a previous worker and native evidence suggest that prior to 1951 this species did not extend beyond the Maseme and furthermore only occurred in low density on this river.

No *G. pallidipes* were found on the survey though bait oxen were used extensively. It is interesting to note that 17 *G. pallidipes* were taken on the head-waters of the Matibi in 1942 and others have been taken from time to time along the Nagupande.

There was evidence of extensive settlements throughout the area covered, but these had been abandoned some years previous, the people moving towards the Nagupande. It is probable that this abandonment of the settlement favoured and possibly even encouraged the tsetse advance since the consequent development of thicket has tended to transform the general woodland into a more suitable habitat.

Game animals, other than elephant which are numerous, were found to be scarce in the area and it is possible that this may be a limiting factor in the *G. morsitans* advance. If this is the case, however, it should not be considered permanent, since evidence suggests that the elephant are recent immigrants and therefore, with the disturbance of game which is now taking place on all sides of this area as a result of resettlement, our operations, and the flooding of the Zambezi, other game can also be expected to seek refuge there.

This area to the west of Kariangwe should be considered for reclamation in the near future in order to consolidate the western end of our present shooting operations.

(b) The Lubu Valley Survey. The mapping of the vegetation of the Lubu Valley has been continued.

(*c*) *Miscellaneous Notes on Tsetse Distribution.* (i) There are reports of a *G. morsitans* advance up the Manyoni river, a tributary of the Sengwa, and it is essential that this be investigated at an early date. It may be added that the entire length of the tsetse front north of Gokwe and between the Sebungwe shooting operations area and the Sanyati operations area requires surveying.

(ii) A young female *G. pallidipes* was taken by an African field assistant at a gathering of cattle at the Manjora spring check point on the 12th December, 1957.

(iii) A *G. pallidipes* female was captured at Lusulu camp on the 19th December, 1957, by Mr. G. K. Gillett.

(4) Investigatory Work.

Investigatory work carried out during the year included certain studies on *G. pallidipes* behaviour, a small bloodmeal collection from *G. pallidipes* and a collection of puparia, both *G. mortisans* and *G. pallidipes,* for laboratory work in Salisbury.

(a) G. pallidipes studies. All the *G. pallidipes* studies were carried out during October, 1957, on the Gwababa river, a tributary of the Mbelele-Lubu river. The work included comparisons between screen, purely human and bait oxen catches, an all day activity catch, comparisons of bait donkey and bait oxen catches and experiments with Morris "animal" traps.

The comparisons between screen, purely human and bait oxen catches once again confirmed the superiority of bait oxen over these other methods. It was also found that parties with screens were slightly more attractive than purely human parties though in previous work during the 1956-57 rains no difference could be demonstrated between these two methods.

The all day catch with bait oxen was designed to follow activity throughout the day during the hot season and was more or less on the lines of another

catch made during the 1956-57 wet season. The method was generally one of hourly catches over a flyround one thousand yards long and working in both directions, with rests of approximately an hour at each end.

The results are best shown in tabular form.

Time	*O.M.*	*O.F.*	*Y.M.*	*Y.F.*	*Total*
5.40 a.m. — 6.40 a.m.	33	32	9	10	84
8.20 a.m. — 9.20 a.m.	11	9	4	7	31
10.45 a.m. — 11.45 a.m.	6	2	1	2	11
1.25 p.m. — 2.10 p.m.	—	—	1	—	1
3.30 p.m. — 4.16 p.m.	1	—	3	—	4
5.35 p.m. — 6.38 p.m.	47	38	11	14	110

From the above the importance of the late afternoon-evening period is once again indicated and furthermore it would seem that in the hot dry weather a marked early morning activity is also exhibited.

Comparisons were made between oxen and donkeys as bait for *G. pallidipes* and the former were found to be considerably more attractive.

The ten Morris "animal" traps were exposed for a thirteen-day period with inspections every two hours during the hours of daylight. The results however were most disappointing and in fact showed little improvement on those obtained during the rains; this was surprising considering the high density of *G. pallidipes* prevailing and the results achieved with this type of trap in the East African territories.

(b) Bloodmeal Work. Eighteen bloodmeals were collected from *G. pallidipes* taken at Gwababa during October, 1957, and these were forwarded to Mr. Weitz, of the Lister Institute, Elstree, England. Results were as follows:

Primates —	
Unidentified	1
Suidae —	
Warthog	4
Ruminants —	
Kudu	2
Kudu or bushbuck	1
Buffalo	6
Unidentified bovids	2
Other Mammals —	
Rhinoceros	2

(*c*) *Puparia collections.* A team of African juveniles varying from eleven to fifteen in number and working under an African field assistant have been making regular collections of *G. morsitans* puparia since May in the Gwababa-Mbelele river area. To date 14,786 apparently live puparia have been collected and the majority of these have been forwarded to headquarters, Salisbury, at intervals with a view to building up a laboratory population. A small proportion of these puparia have been passed on to Dr. Barrass, of the University College of Rhodesia and Nyasaland for work on parasitism.

A further team of five juveniles working under a tsetse survey hand have been collecting *G. pallidipes* puparia and shells in the same area since the beginning of August. They have collected 947 apparently live puparia and 4,397 shells.

It should be noted that the *G. morsitans* work indicated a marked seasonal shift of "breeding grounds". To begin with in the early dry season puparia are mostly found beneath rocks and under fallen logs on the slopes of the escarpment hills; in the mid-dry season puparia seemed to be most numerous under fallen logs and in rot holes in trees in the mopane woodland and along the sinanga thicket—mopane woodland contacts; and in the late dry season there was a shift towards the rivers and puparia could be found in large numbers in holes in the banks, under logs and roots along the banks and under the leaf layer on the sandy river beds.

G. pallidipes puparia and shells were generally found within the riverine areas under small thickets and shrubs, in holes in the banks and under logs. Puparia were also numerous beneath the leaf layer on sandy river beds during the latter half of September and mixed *G. pallidipes* - *G. morsitans* collections occurred.

(*d*) *Trypanosome Challenge and Infection Rates.* The Department of Veterinary Services is now carrying out drug trials in experimental cattle at Kariangwe. It is desirable to know the chances of infection to which these cattle are subject. Miss B. Leggate, Entomologist, notes as follows:—

In order to determine the trypanosome challenge, a start has been made in

the assessment of infection rates in tsetse flies in their natural state. Five hundred male *G. morsitans* were dissected at Kariangwe in May and June, 15.7 per cent. of which were found to be infected with trypanosomes of the *vivax* and *congolense* groups. No polymorphic trypanosiomes were detected.

A further four hundred male flies were dissected at Kariba in August and September, where the infection rate was found to be slightly higher (17.5 per cent.). Again only the *vivax* and *congolense* groups were apparent, *vivax*, as also in the former case, predominating.

This work is being continued and extended to *G. pallidipes*.

B. URUNGWE—by R. Goodier, Entomologist.

(1) General.

Work in this area may be considered under four heads.

(a) Bush clearing schemes in conjunction with native settlement.

(b) Survey work.

(c) Fencing work in the North Urungwe.

(d) Preparations for the Kapondo insecticide experiment.

Due to the reorganization of the administrative methods adopted in the area it has been necessary to give rather more time than usual to administrative work during the past year.

(2) Bush Clearing and Native Resettlement.

The initial stages of the work involving bush clearing and the resettlement of natives in the Special Native Area to the south-west of the Urungwe were described in a "Preliminary Report on the Rengwe Valley Reclamation Scheme, October, 1957." In this scheme the removal of approximately 80 acres of riverine vegetation at a cost of about £5.7 per acre followed by dense native settlement in the area resulted in the complete elimination of a focus of tsetse in the Rengwe Valley where only a few months before apparent densities of non-teneral male *G. morsitans* of between 100 and 300 had been recorded. The last tsetse recorded from the Rengwe Valley was taken in August, 1957, and since that time the agricultural exploitation of the valley by the settlers has rendered it totally unsuitable for inhabitation by tsetse. Towards the end of 1957 selective bush clearing was undertaken in the small adjacent area of the Kadzomba-Tsuwiri River watershed and this has resulted in a considerable decline in the apparent density of *G. morsitans* in the area but not its complete elimination. This latter may be achieved by the native resettlement which commenced in the area in August, 1958. The area to the east of the Rengwe, known as the "Kenyongo" area has also been settled by natives in August, 1958. Tsetse are only caught occasionally in this area and it is thought that the disturbance of the area caused by the settlement will result in the elimination of the small tsetse population without any additional measures such as bush clearing being undertaken.

(3) **Survey Work**

Most of the survey work has been undertaken in relation to the reclamation schemes in the S.W. Urungwe and the insecticide work at Kapondo in the N.W. Urungwe, but patrols have been made quite regularly to study the tsetse situation in various parts of the Zambezi Valley.

A great decline in the availability of *G. morsitans* in the Chirundu area took place during the hot season October-November, 1957, and is discussed in a report on "The Tsetse Situation in the Chirundu Area, September, 1956, to December, 1957." The reasons for the exceptional decline in 1957 cannot be determined with any certainty on the available evidence but meteorological records suggest that 1957 was a hotter year than usual in the Chirundu area.

Survey work in the area of the Rekomitjie Mission has demonstrated the presence of high populations of *G. morsitans* and *G. pallidipes* in the area. It is considered that this area would be an excellent one in which to undertake field experiments of various types and the development of the old Rekomitjie Mission as a field research station is planned.

In the Kariba area the clearing of large areas of the future lake floor has resulted in the disturbance of tsetse but they are still to be found quite readily right up to the edge of the clearings. The Kessesse and Nyanyanya fly-rounds have been destroyed by the bush clearing but the Chavaru Flyround is still followed periodically and an apparent density of non teneral male

G. morsitans of 92 was recorded in August, 1958, in spite of the fact that the area is in close proximity to an area of human activity.

A patrol made to the Mauora River area at the foot of the Zambezi escarpment to the west of the Angwa River during the wet season confirmed the presence of large *G. pallidipes* and *G. morsitans* populations.

(4) Fencing

In view of the need for economy it was decided that the new North Urungwe Game Fence should take a line from the Gache-Gache Gorge at the foot of the escarpment eastwards to the region of the Naodsa-Tsororo River junction and to the Rekomitjie Gorge, a total distance of approximately 78 miles. It was not considered necessary to continue the fence westwards to the Sanyati from the Gache-Gache gorge as the escarpment is a formidable barrier in this area and the edge of the future Kariba Lake lies very close to it. Any game migrating up the escarpment in this area when the lake floods would enter very inhospitable country where game destruction is already in progress. There does not appear to be any very good reason for extending the fence eastwards beyond the Rekomitjie River at the present stage of operations as the situation in this area is unlikely to be much affected by the flooding of the Kariba Lake. Much of the country south of the escarpment in this area appears to be "marginal" for tsetse and such danger areas as the Rekomitjie and Chewore watersheds could probably be attacked in future more satisfactorily by methods other than game destruction.

In the early stages fencing operations were held up by the wet season and by the difficulty in obtaining labour, but the Makuti-Rekomitjie section was finished by the end of June and that from the Gache-Gache to the Naodsa by the third week in August. It is hoped that it may prove possible to finish the fence by the end of October, 1958.

It is intended to recommence game destruction operations to the south of the fence after the wet season, 1959.

(5) The Kapondo Insecticide Experiment

The preliminary surveys for an experimental attempt to eliminate tsetse from the Kapondo area by the application of dieldrin (Dieldrex) to the riverine and termite mound vegetation were undertaken and observations on a number of flyrounds begun. The first spraying, using 689 gallons of 1.8 per cent. dieldrin, applied by portable spraying, was carried out at the end of the year under review. It is as yet too soon to assess the results of this work.

(6) Review of the Present Situation in the Urungwe Area

The tsetse situation appears to be fairly quiescent in the Urungwe area at the present time and it is to be hoped that this state of affairs will persist long enough to allow the anti-tsetse measures being undertaken to exert their full effect. In the last eighteen months the density of tsetse in the S.W. Urungwe has declined very markedly. There is little doubt that the reclamation and settlement schemes in the Rengwe and adjacent areas have done much to hasten the disappearance of tsetse already greatly reduced by a successful game destruction campaign. North of the settlement areas game destruction is being carried out between the Fulechi and Kanyati Rivers where tsetse are still to be found, although only in small numbers. Game destruction operations have been suspended north of the Kanyati so as not to interfere with the insecticide experiment in the Kapondo area but it is intended to resume shooting next year to discourage any migration of animals into the area from the Zambezi Valley when the Kariba Lake starts to fill up. At present there are no anti-tsetse measures being undertaken within the Urungwe Native Reserve as it is thought that the progressive increase in native population in the Western half of the Reserve in the near future will be sufficient to prevent re-invasion of the Reserve. During the past year a few tsetse have been taken in the Zwipani area in the western half of the reserve. These are thought to be the result of a seasonal infiltration up the Kanyati River System from the west.

Once the northern game fence is completed it will be necessary to resurvey the tsetse situation in the area to the south of it so that suitable control measures may be devised. Particular attention should be paid to the Manyangau area and the occurrence of *G. pallidipes* in the area investigated.

C. Sabi-Lundi Area—by R. J. Phelps, Entomologist.

(1) Introduction

In the course of the twelve months under review, a considerable deterioration of the tsetse and trypanosomiasis position has occurred. It appears that the large tsetse infested region in Portuguese East Africa is expanding rapidly southwards and westwards, resulting in much country which has been tsetse free since pre-rinderpest days becoming infested.

The precise cause of the rapid advance is obscure, but such events are by no means unknown in the study of animal populations. Before counter measures can be instituted, it is necessary to determine the extent of the advance, and the limits to which it might extend. As staff become better trained, the necessary work will advance more rapidly. Meanwhile steps have been taken to extend defence operations already in being.

(2) Investigational Work

Surveys. An intensive study of the area immediately south of the Lundi river, and adjacent to the International boundary, was the major undertaking this year.

There had been occasional reports of tsetse appearing on the Portuguese East African Border for some years. Thus Hornby, in 1946, produced a map showing "probably *G. morsitans*" adjoining the border south of the Lundi-Sabi confluence, although a Portuguese map dated 1945 showed tsetse only up to about 15 miles west of Massangena. *G. morsitans* was reported near the border in 1950 and in 1951, near Marumbene. In 1956 a female *morsitans* was taken some distance west of Marumbene and in the next year, Mr. Middleton Stokes took a male just south of Chidhlambani Pan. During May and June, 1958, Mr. Stokes showed that *G. morsitans* were numerous along the border road within three miles of Kapitan's Village and so far west as Chidhlambani Pan, and the upper Mutezwa River. One *G. pallidipes* was also taken near Kapitan's. As a result of this survey a Field Officer was stationed near Kapitan's to prepare bush roads and to continue more detailed surveying.

A rather restricted survey was made on the upper Musaswe river on the east bank of the Sabi. No tsetse were taken, but the distribution of trypanosomiasis cases in the region indicates that tsetse, in low density, are present. Attempts to confirm this continue. A similar situation pertains in the escarpment country to the east of the Musikavantu Reserve.

Although extensive surveys on the west bank of the Sabi have not been possible this year, short patrols have confirmed the presence of tsetse as far west as the game fence. This represents a considerable advance of tsetse in the last 12 months.

The use of bait animals in survey work has been started, and greatly facilitates the work. Aerial photographs are now available for much of the area. and the rate of coverage of the country is increased by using them.

Flyrounds. Much of the hill country of the lower Sabi Valley is covered by vegetation having *Brachystegia tamarindoides* as the dominant species. This type of woodland does not occur to any great extent in other tsetse areas of Southern Rhodesia, and an attempt is being made to determine the behaviour pattern of tsetse in this habitat.

Traverses laid out on the grid pattern, are being used in this investigation, and are covered at frequent intervals by African survey hands. Records of blood meals from gorged tsetse are being kept, and it is intended that pupal casing surveys will be made in the near future. After the investigations have run for a year it may be possible to indicate habitat essential to the tsetse and so provide the information necessary for an attack on the tsetse by discriminative use of bush clearing and/or insecticides.

South of the Lundi, investigations are proceeding to determine the present limits of the tsetse. Roads have been cut, and at present traverses along these are being covered at regular intervals. As yet the tsetse density is still low, and normal flyrounds would not yield much information.

(3) Distribution of Tsetse and Trypanosomiasis

On the accompanying map the position of the tsetse front has been marked as accurately as possible. Only definite catches of tsetse have been used

in determining the limits, either from traffic control points, surveys, or patrols. The records from gates tend to exaggerate the position, as tsetse are carried considerable distances on traffic, but in most cases tsetse have been recorded by other methods in the vicinity of gates.

Species recorded in the infested area include both *Glossina pallidipes* Aust, and *G. morsitans* Westw. Limits shown on the map are for *G. morsitans* only, but on the east and west banks of the Sabi *G. pallidipes* has been recorded over almost the whole area. South of the Lundi, *G. pallidipes* has seldom been taken. Bait animals will soon be used in the area, and bigger catches of *G. pallidipes* can be expected.

It is of interest to note that *Glossina austeni mossurisensis* Santos Dias has been taken on the Sabi river near Massengena. This species has never been recorded in Southern Rhodesia, but much of the Sabi region provides suitable habitat.

Considerable anxiety has been caused by the appearance of trypanosomiasis among cattle in areas previously free of the disease. Matibi Number Two Native Reserve, Lone Star Ranch, Devuli Ranch, Masapas Ranch, and Humani Ranch have all had cases. The outbreak in Matibi was particularly severe and a number of animals died. Cattle in the Musikavantu Reserve contracted the disease in some numbers this year, but losses were light. Cases on Humani Ranch and in the Musikavantu Reserve are a considerable distance from any known tsetse, but intensive surveys in the escarpment region may well reveal tsetse, and clarify the situation.

(4) **Communications**

Two hundred and eighty-three miles of roads have been maintained during the year, and eighty-four miles of new road have been cut. The majority of the new roads were made south of the Lundi, where there were previously none. An extremely heavy wet season caused much damage to the roads, and it has not been possible to repair all of it this year.

The main camps in the region are now in radio contact, which considerably reduces the administrative problems.

A new access road from Lone Star Ranch to the Ndanga East Native Reserve has been built. The cost has been shared by this Department and the Roads Department, with the actual work being performed by labour supervised by the Department of Native Affairs. Check points have been operated on all roads entering the tsetse area.

(5) **Control Measures**

Fencing. The fencing programme required to effect clear delimitation of the areas in which game elimination is carried out has proceeded satisfactorily. On the east bank of the Sabi, thirteen miles of new fences have been completed near the International boundary, south of the Musenasena-Rupembe junction. A further twenty-five miles of fence along the border has been completed apart from erection of the wire. Besides restricting game movements, these fences will have the effect of channelizing traffic, mainly pedestrian, into Southern Rhodesia through deflying points.

On the west bank of the Sabi, the game fence from the Sabi five miles north of the Sangwe Reserve to the escarpment south of the Lundi, is now complete. The Sangwe and Ndanga East Reserves have had boundary fences erected, and the creation of a game and cattle-free zone between the fences is under way.

An eight-mile long game fence between the western fence and the Reserve boundary fence has been erected just south of the Mkwasini river. The fence was designed to lead animals from south of the river into the country north of the river, using the seasonal movement of game to water to achieve this. The fence will be closed finally just before the break of the wet season.

Maintenance and protection of all fences in the area is a major undertaking, and in places wells have had to be made to supply water for maintenance gangs. The value of the protective work is shown by the fact that only five miles of fence were damaged by veld fires this year.

A start has been made on suspending large metal discs along the game fences. It is thought that the increase in visibility of the fence caused by the discs will reduce the number of breaks in the fence due to game movements.

Bush clearing. On the east bank of the Sabi, progress is being made with the drainage line bush clearing on the Honde and Rupembe river systems. It

is possible that a settlement scheme may be instituted in this region, and the combination may provide adequate protection against the tsetse advance.

Bush clearing on the west bank has been confined to the Bandai block. Due to a lack of labour, work was suspended after 1,000 acres had been cleared, but has now recommenced on the remaining 2,000 thousand acres. The block is situated in the south eastern corner of the Ndanga East Reserve, and apart from the anti-tsetse value, it will considerably enhance the grazing potential of this part of the reserve.

Game elimination. It was decided that on the east bank of the Sabi the total hunter force would be concentrated on the Makosa hills area. This zone has always been the major source of animals on the east bank, and although hunted for many years still supports sufficient game to enable tsetse to survive. Hunting was suspended altogether during the construction of the game fence, which was designed to define the area and to prevent ingress of game from Portuguese East Africa.

Since completion of the fence three camps, each of ten hunters, have been started. A fourth camp will be opened as soon as a well is completed. A hunter density of two to the square mile is being used, which is far higher than that used elsewhere in Southern Rhodesia. It is too early yet to say whether tsetse elimination is being achieved, but if the rate of game elimination continues at its present level success may be expected in two more years. It is intended that discriminative clearing will be used to supplement the game elimination, and to render the country unsuitable to further invasion by tsetse.

Difficulty has been experienced in maintaining the hunter force in the four hundred square mile area of game elimination on the west bank of the Sabi. The scheme is based on a density of one hunter per five square miles, together with a roving gang of good hunters who can be used in any locality where game is concentrating. At times the hunter force has been down to half strength, and success of the operation is limited by this factor.

A nine-month shooting season is being worked, and it was estimated that eighteen hundred head of game would have to be eliminated per year if the scheme was to be successful in three to four years. After the first season the shortfall was two hundred head, and it is unlikely that this will be made up in the current season.

A Field Officer has been occupied full time on the hunting scheme, and control of hunters has been satisfactory. Very little migration of game into the area has been recorded.

Blood slides have been taken from animals destroyed in an attempt to indicate which species of game are most important from the trypanosomiasis point of view. To date the only positive smear has come from an Impala.

Elephants are still resident in the area, and are destroyed by Europeans only. As yet there has been no major influx of elephants from Portuguese East Africa, where a large scale elephant elimination scheme is in progress.

D. Other Areas—by G. F. Cockbill, Senior Entomologist.

North Lomagundi (Doma)

No tsetse and no cases of trypanosomiasis were recorded from the Doma area south of the escarpment.

Tsetse occur in some density in the Zambezi Valley from the Angwa river to the Hunyani, and appear to be more abundant nearer the Angwa. East of the Hunyani they occur in limited areas and in small numbers along the Dande and Ambi rivers.

At the close of the wet season a determined effort was made to construct a road through the escarpment so that the region in the Zambesi valley between the Hunyani and Angwa rivers could be accessible throughout the year. It was no small achievement for the Field Officer, with his slender resources, to complete this road. A new camp has been constructed at Chenanga, north of Doma which is accessible during the rains. Formerly, with his camp in the Zambezi valley at Mashungayendi, the Field Officer was isolated for several months each year.

The general situation is regarded as being static. Intensive anti-tsetse operations within the Zambesi valley must await decisions on the future development of the area.

Sanyati (S.W. Lomagundi)

The situation in this area is satisfactory. No extension of tsetse has been recorded. The hunters have been re-distributed so as to form a cordon west of the Umniati and Sanyati rivers to prevent game from invading the tsetse free areas east of these rivers. To assist in this operation, a fence will be constructed from the Ganderowe Falls to the Mafungabusi Plateau.

Mtoko

Despite the marked increase in tsetse activity in Portuguese East Africa adjacent to the international boundary, there has been no recorded advance of fly into the Mtoko area, and only eight cases of trypanosomiasis have been recorded from the Chikwizo, Mtoko and Fungwe Reserves. There have been no deaths from trypanosomiasis recorded.

A temporary traffic control point operated within the Chikwizo Reserve about 10 miles from the international boundary. It demonstrated that African pedestrians carried *G. morsitans* within the Reserve and could be the means of disseminating the tsetses responsible for the isolated occurrences of the disease.

The game fences are maintained in good condition by regular patrols. The area has now come under the control of one field officer stationed at Border Camp.

The Eastern Border (Chipinga)

With 171 reported cases of cattle trypanosomiasis, the position on the Eastern Border Farms has been the worst since 1943 in which year 270 infections were diagnosed. Since the year before that, when there were 329 infections, there had been a more or less steady decline up to 1954 when only 16 cases were recorded. In 1955 there was an increase to 57 cases; 1956 was again lower with 23 cases, 1957 showed 69 cases and this year, as noted, there have been 171. It is possible that we are witnessing a cyclical fluctuation in tsetse numbers and/or the infection rate in the tsetse population, such as has been observed elsewhere in Africa. As usual the peak months for infection were February to May. In the latter month, there were 35 cases. These had dropped to 10 by August.

Within the limits of our present knowledge it may be noted that climatic conditions as recorded in Chipinga apparently were such as to encourage a high infection rate in the cattle. During the period of build-up of infection (January to March) 10.79 more inches of rain than average for the quarter fell, thus presumably creating conditions especially favourable to the dispersal of *G. pallidipes*. At the same time the mean temperature for the quarter preceding this was 1.5° F. above the average, so perhaps favouring conditions of pupal development leading to production of tsetse capable of a high infection rate.

An inspection of the border clearing work early in the year had suggested that modifications in the procedures adopted to keep open the clearing might have advantages. It was evident that the annual re-slashing of the clearing was having different effects on different vegetation types and that these effects were in turn variously modified by the farming practices superimposed upon them. In certain areas continuous slashing of regenerating trees appeared to be having a generally deleterious effect on pasture. It was decided in January to restrict annual re-slashing of the clearing to a zone one mile in width from its eastern edge. At the same time the advice of other departments concerned with rural development was to be sought about other methods of bush control. When it was realized that the year would be a bad one from the viewpoint of nagana, it was decided not to depart from the new policy. A joint survey of the area was undertaken in August in which officials of the Conservation and Extension Department, the Veterinary Department and the Department of Native Agriculture took part. Following this survey it was decided to undertake experimental continuous re-slashing on a small scale in different parts of the clearing; to investigate the effect of residual insecticidal spraying along the Portuguese border in preventing movement of tsetse into the clearing during the wet months, and also to explore the possibilities of using phytocides on certain vegetation types which are costly to control by slashing. A complicating factor in the maintenance of the border defence scheme is the increase in tree plantations among tea estates.

3. GAME DESTRUCTION

The policy of confining the areas of game destruction by fences continued to be implemented, though fence construction is not yet complete everywhere. The customary table of game shot during the year is given.

Larger Game		*Smaller Game and Carnivores*	
Elephants	54	Duiker	5,180
Zebra	75	Oribi	71
Buffalo	141	Steenbok	4
Tsessebe	7	Sharpe's Grysbok	4
Waterbuck	63	Bushpig	683
Reedbuck	114	Warthog	2,712
Sable	320	Baboon	2,071
Roan	60	Wild dog	30
Eland	54	Hyaena	18
Kudu	1,641	Leopard	7
Bushbuck	1,047	Lion	1
Nyala	14		
Impala	539		
Wildebeeste	1		

Larger game	4,130	(27·7%)
Smaller game and carnivores	10,781	(72·3%)
TOTAL	14,911	

This total is 3,092 fewer than last year and 26,465 fewer than the total for 1954-55. It is likely that the figure of about 15,000 head per annum will be maintained for some time to come; at least until the fenced areas are shot out. Once these defence zones are established, it is the intention to use game destruction only to supplement other methods of tsetse control when these become very expensive or otherwise difficult to apply.

4. TRAFFIC CONTROL

Traffic on roads leaving the tsetse belts continues to be "de-flied" at cleansing chambers and gates. The catches at these points serve a double function—to prevent carriage of tsetse into fly-free areas and also to provide an index of the density of tsetse fly in the areas through which traffic has travelled. A problem of some interest is to decide when a chamber or gate ceases to be of value; thus the Magunge Chamber which deals with all traffic leaving the Urungwe Reserve has not caught a tsetse fly for four years. Its closure would, however, undoubtedly perturb the farming community in the Karoi area. Probably the time to make the decision will be when the proposed scheme to re-introduce cattle to the eastern half of the Reserve has been successfully completed, since the presence of stock will provide a sensitive index to changes in the tsetse position.

The interpretation of chamber and gate figures is not a simple task and certain aspects of traffic and tsetse data analysis were described in a paper by the Senior Entomologist, which was presented at Brussels to the 7th Meeting of I.S.C.T.R. (see below, section (i)). Statistics of traffic control for the current year are given in Appendix I.

5. CONFERENCES, COMMITTEES AND MEETINGS

The Director attended the 7th Meeting of the International Scientific Committee for Trypanosomiasis Research, held in Brussels, 25th to 30th August, as the Federal delegate . He was accompanied by Mr. W. S. Steel, Chief Entomologist of the Game and Tsetse Control Department of Northern Rhodesia, as observer. Four papers, by members of the Department were presented to the Committee as follows:—

(i) "The Use of Records from Traffic Control Points in Southern Rhodesia," by G. F. Cockbill.

(ii) "*Glossina pallidipes* in Southern Rhodesia's Northern Tsetse Belt," by D. F. Lovemore.

(iii) "Some Effects of Bush Clearing in Southern Rhodesia," by R. Goodier.

(iv) "A Note on the Location of *Glossina morsitans* Westw. on Transect Fly Rounds," by J. Ford.

The Director also attended the 6th International Congress on Tropical Medicine and Malaria held in Lisbon from 5th to 13th September and presented a paper entitled "Tsetse Fly Reclamation and Development in Eastern Africa".

The Senior Entomologist in his capacity as President of the Southern Rhodesia Scientific Association delivered an address to the Association entitled "The Control of Tsetse and Trypanosomiasis in Southern Rhodesia".

The Head of the Anti-Trypanosomiasis Commission of Portuguese East Africa, Dr. M. A. Andrade Silva, visited Umtali in February to discuss matters of mutual interest with the Director and the Entomologist-in-Charge of the Sabi area. The two latter officers accompanied Dr. Andrade Silva and officers of his staff on a three-day inspection of the tsetse belts around Espungabera and the Rio Save in July.

The Tsetse and Trypanosomiasis Control Committee has continued to meet each month under the chairmanship of Dr. G. R. Ross. In certain districts local committees have been set up under the chairmanship of the Native Commissioner, i.e., Urungwe, Chipinga and Ndanga East. Departmental officers have attended meetings of Farmers' Associations in Chipinga and Chiredzi and of the National Cattle Committee of the Rhodesia National Farmers' Union.

6. HUMAN TRYPANOSOMIASIS

Sleeping Sickness continues to persist at a very low incidence of infection in the more easterly portion of the Zambezi Valley. During the year two cases were reported, one presumably infected at Chirundu, the other nearer, if not over, the Portuguese border near Feira.

7. ACKNOWLEDGEMENTS

It is a pleasure to record appreciation of the help of several Departments, especially those necessarily closely affected by the Trypanosomiasis problem, the Veterinary, the Native Affairs and the Game Department and the National Parks Department. The two latter have provided particularly valuable help in the control of elephants in our fenced shooting zone in South Sebungwe.

The Tsetse and Trypanosomiasis Control Committee has been most helpful towards a newcomer and has given most valuable support during a difficult year.

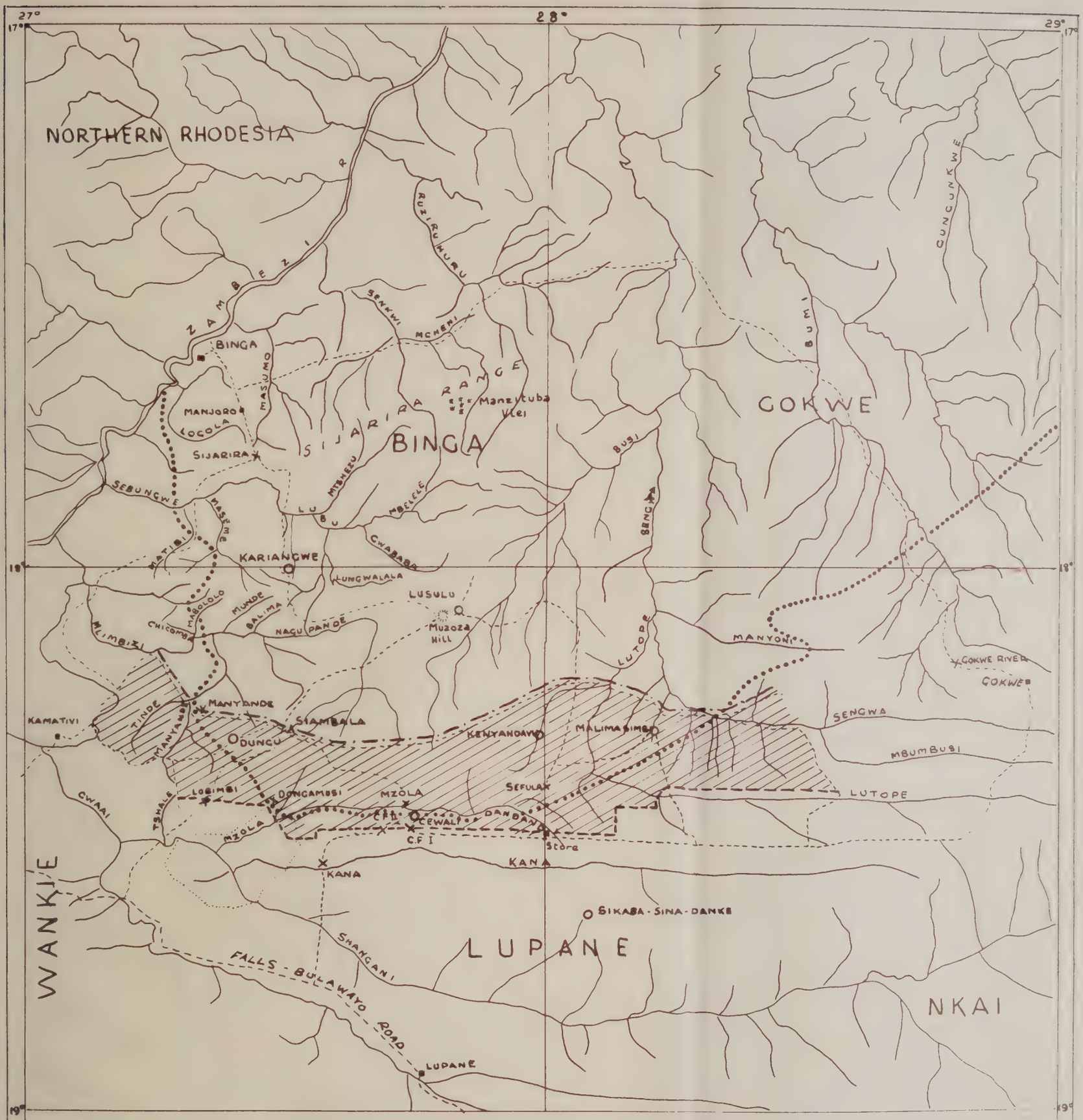
In particular, however, the very friendly, keen and loyal attitude of the Department as a whole towards the new Director has been a source of much encouragement and great satisfaction.

J. FORD,
Director.

District		Cars				Cycles				Pedestrians			
		No.	M	F	Total	No.	M	F	Total	No.	M	F	Total
North Urungwe . .	*m*	148,894	166	167	333	26,052	120	92	215	27,782	145	103	248
	p		7	5	12		—	2	2		2	2	4
Urungwe Native Reserve	*m*	12,759	15	9	24	32,744	35	21	58	32,881	30	16	46
	p		—	—	—		—	—	1		1	—	1
Mtoko	*m*	17,452	26	35	61	8,188	19	7	26	12,985	6	5	11
Sabi East	*m*	3,677	148	83	231	30,826	713	353	1,066	108.109	1,236	720	1,957
	p		4	8	12		22	36	58		35	30	65
Sabi West	*m*	1,575	2	1	3	9,174	32	12	44	17,902	43	10	53
	p		—	—	—		2	—	2		4	3	7
Chipinga (Mt. Selinda).	*m*	3,780	2	1	3	8,112	—	—	—	12,429	—	—	—
	p		—	1	1		—	—	—		—	—	—
	b		—	1	1		—	—	—		—	—	—
Sebungwe	*m*	7,597	547	352	899	26,721	1,430	553	1,983	53,559	717	306	1,023
	p		4	3	7		3	2	5		9	1	10
Total . . .	*m*	195,734	906	648	1,554	141,817	2,349	1,038	3,392	265,647	2,177	1,160	3,338
	p		15	17	32		27	40	68		51	36	87
	b		—	1	1		—	—	—		—	—	—

m. *Glossina morsitans*
p. *G. pallidipes*
b. *G. brevipalpis*
Totals include flies of which the sex was undetermined.

GFC/ER
26th January, 1959.



TSETSE FLY OPERATIONS SEBUNGWE.

SABI LUNDI AREA

Tsetse and Trypanosomiasis Distribution 1958